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Water transport in the Bristol Channel, Wales and the Marches during the Romano-British period

"Water transport in the Bristol Channel, Wales and the Marches, during the Romano-British period"

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Abstract

The thesis is a study of the maritime dimension of Roman transport, to and from the military installations and civilian settlements of Wales, the Marches and the Bristol Channel during the mid-1st to early-5th centuries AD. The aim is to determine the extent to which the waterways of the study area were used for military and commercial traffic during the Romano-British period. It argues that water transport was a major factor in the Roman supply system, and that, whilst the Roman system of roads has received much attention, insufficient attention has been paid to the role of water transport.

Evidence is drawn from classical writings, geomorphological and archaeological evidence for change, on-site assessment of the navigable potential of locations, archaeological data on forts, settlements, ships and boats and analogous data from later periods.

Changes in the coastal and riverine landscape are examined, followed by consideration of the ships and boats of the period. Because of the major impact of the Roman army on the study area, the logistical system employed in military supply and replenishment is examined. Rome as a maritime power, the *Classis Britannica* and the role of naval units operating in the western sea-routes, cooperating with the army in both supply and offensive combined operations are discussed. Rome possessed a high level of competence in fluvial engineering and this impacted on the development of rivers, ports and landing places in the study area. Probable cargoes and cargo-carrying capacities, supported by archaeological evidence, are examined and quantified. Patterns and directions of trade and commerce, supported by a database of locations accessible by water transport, are the basis for an evaluation of the volume of shipping. This assessment covers general trends and highlights specific periods, within the almost four hundred years of the Romano-British period.

This thesis is dedicated to the memory of the soldiers of the Roman Army in Britain; the study of whose exploits have given me so much pleasure, during the course of the past fifty years.

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In the Department of Continuing Education; Mark Corney, Julian Richards and Canon John Rogan gave me the incentive to become a full-time student. The transition was made possible by, in particular, the efforts of Dr Larry Barham, Dr Mark Horton, Dr Nicoletta Momigliano and Dr Kate Robson Brown. My fellow undergraduates of the "The Class of 2000" accepted the most mature of mature students, and welcomed me to their parties! The Departmental Support Staff, Sue Grice, Cecilia Smith and Olivia McClelland, acceded to all but the most unreasonable of my requests. Dr Michael Costen and Robert Hopkins have kindly read and commented on this thesis

I am grateful to the following for laying the foundations of my interest in this topic. The "Appledore Boys" of the 1940's for showing me how to enjoy the sea, and Captain William Quance, Master Mariner, for teaching me to treat it with respect. The members of Weston Bay Yacht Club, for good times in the muddy waters of the Bristol Channel. The Officers and Men of the 1st Battalion of the South Staffordshire Regiment, for making me a soldier.

My wife, June, has been a most willing proof-reader, perhaps as a *quid pro quo* for my time at the University having kept me "from under her feet", during the early years of my retirement.

AUTHOR'S DECLARATION

I declare that the work in this dissertation was carried out in accordance with the Regulations of the University of Bristol. The work is original except where indicated by special reference in the text and no part of the dissertation has been submitted for any other degree.

Any views expressed in the dissertation are those of the author and in no way represent those of the University of Bristol.

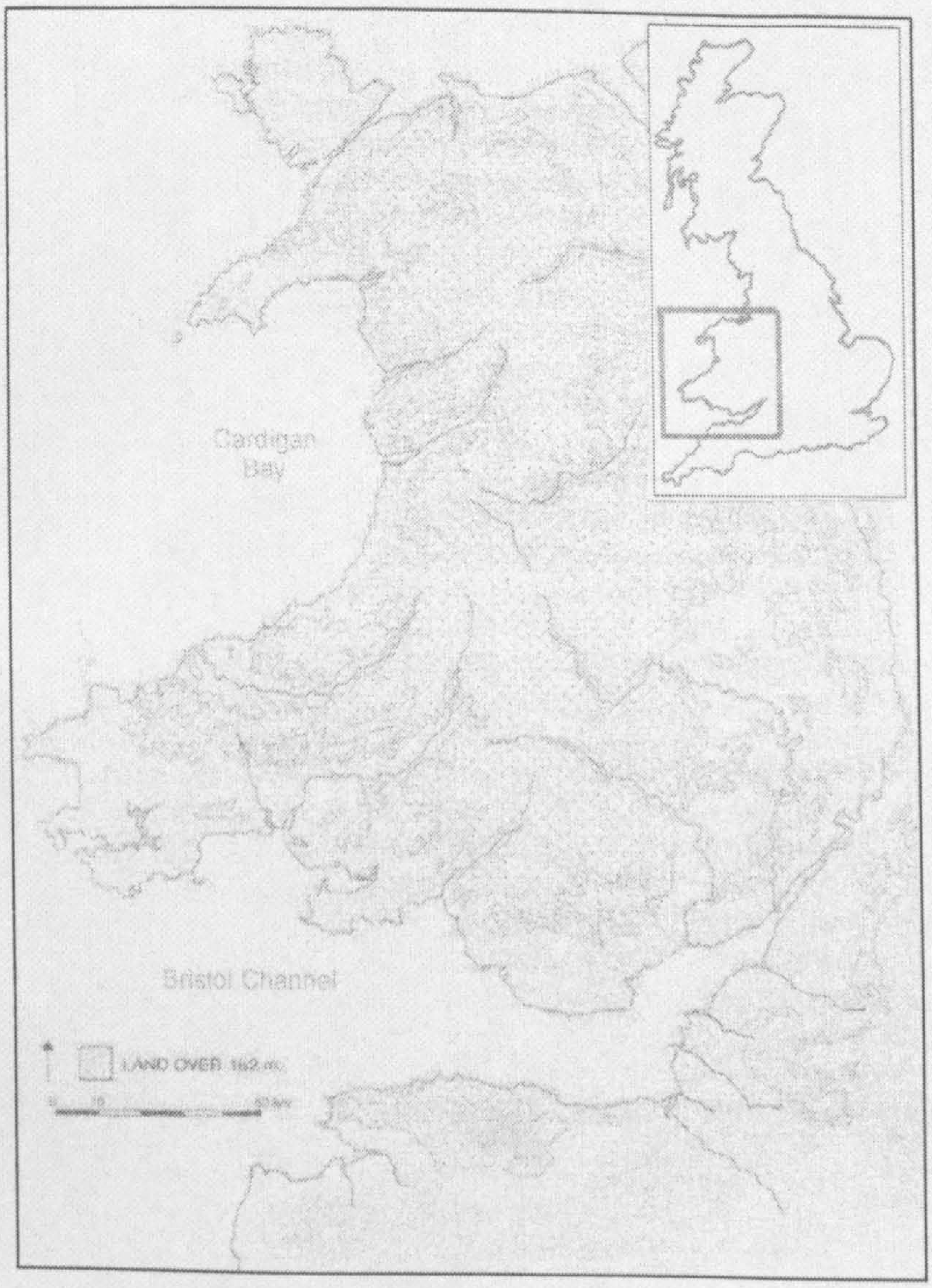
The dissertation has not been presented to any other University for examination either in the United Kingdom or overseas.

SIGNED: James Ellis Jones DATE: 12 MAY 2006

Table of Contents

List of Figures

The Study Area



Wales, the Marches and the Bristol Channel

Chapter 1 - Introduction

This thesis is a study of the maritime dimension of Roman transport, to and from the military installations and civilian settlements of Wales, the Marches and the Bristol Channel during the mid-1st to early-5th centuries AD. The aim is to determine the extent to which the waterways of the study area were used for military and commercial traffic during the Romano-British period. It is intended to gather together the various strands of evidence and, through systematic analysis, to argue that water transport was a major factor in the Roman supply system, and that, whilst the Roman systems of roads has received much attention, insufficient attention has been paid to the role of water transport.

Evidence will be drawn from a variety of sources, namely

Classical sources

Geomorphological and archaeological evidence for change

On-site assessment of the navigable potential of locations

Archaeological data on forts, settlements, ships and boats

Analogous data from later periods

In addition, the writer has considerable experience of sailing on the coasts and rivers of the study area, as well as delivering boats to the Mediterranean. However, it is clearly unwise to relate directly modern craft and weather conditions to those of the Roman period, and this temptation will, hopefully, be avoided.

The organisation of the thesis is intended to follow a structured progression, leading to a logical conclusion, and to this end, the chapters are arranged in the following order. Firstly, changes in the coastal and riverine landscape will be examined. This will be followed by a description of the ships and boats of the period. Because of the major impact of the Roman army on the study area, the logistical systems employed in military supply and replenishment will next be examined. Consideration will then be given to the concept of Rome as a maritime power, and the role of the *Classis Britannica.* The probable role of Roman naval units operating in the western sea-routes, cooperating with the army in amphibious operations, and playing a major role in supply and replenishment of will then be discussed. The level of the Empire's competence in fluvial engineering and the development of rivers, ports and landing places in the study area follows. The probable cargoes and cargo-carrying capacities, supported by archaeological evidence, will then be discussed. Probable patterns and directions of trade and commerce, supported by a database of locations accessible by water transport, will be the basis for an assessment of the volume of shipping. It will be suggested that, on the coasts and rivers of the study area, this was governed initially by military necessity, and later by economic expediency.

Database of locations on the coasts, estuaries and rivers

In order accurately to assess the nature of supply and replenishment of the military and civilian settlements in the study area, all sites that may have been supplied by water transport were visited. From the considered limit of navigation, all bridging points down-river were visited, and, based on a long experience of small boat handling on the coasts and rivers of Wales, the Irish Sea and the Bristol Channel, a balanced judgement was made as to the probability of access by water transport.

When considering the problems of supply and replenishment, the most significant factors are location in relation to complementary routes of supply, size of garrison, population of civilian settlements, significant periods of construction, and periods of occupation and abandonment. Fortunately, for the purposes of this study, even the less sophisticated archaeological investigations of the later 19th and earlier 20th century recovered sufficient coins and pottery to provide dating evidence. Excavation was adequate to provide details of foundations to give information on size and construction details; and recovered dedicatory and funerary inscriptions giving, in many cases, the types, strength and periods of occupation of specific military units.

The overall structuring of the data, and the detail of the individual items, is the result of several attempts at finding a cohesive and readily understandable method of presentation. Somewhat reluctantly, it was eventually decided to settle for a conventional grouping by fortress, fort, city, small town and settlement, and to place these categories in the series of time-frames as shown in the text. This in itself has several disadvantages, notably the appearance of a single site under more than one heading, (for example, Abergavenny appears both as an early fort and an ironworking small town), also the fact that geographical identity is obscured. However, it is hoped that the maps provided within the text (*Figures* 10. 1-5) will go some way to aid the problems of interpretation and clarification.

The entries for individual sites have also presented a variety of problems, not least in selecting the level of information to be included. For example, there are plans available for the majority of the forts in the study area, in many cases based on early excavations, but many owe as much to the inspired use of the dotted line, as to firm archaeological evidence, and therefore only some of the more reliable specimens are included. There is also considerable variation in the size of the entries for individual locations, with extra space being allocated to recently excavated and published forts such as Caernarfon (Casey & Davies 1993) and Loughor (Marvell & Owen-John 1997). By contrast, a single sentence covers Whitehouse Farm, where the only evidence is a series aerial photographs showing crop marks of a pair of ditches with rounded corners, whereas the nearby campaign base at Clyro, of similar size and period, has sufficient information to justify a full paragraph. The relationship of a site to the extensive system of Roman roads is important when considering the relative merits of road or water transport, and each site entry contains this data.

Within these limits, the database fulfils its desired function, as it contains sufficient information for the assessment of population, demand and the volume of shipping.

The landscape of the study area

The study area is bounded by the Irish Sea, the Bristol Channel and the rivers Severn and Dee, and includes the modern principality of Wales, the counties of Herefordshire, Worcestershire, together with substantial parts of the counties of Shropshire, Cheshire, Gloucestershire, and the north coasts of Somerset, Devon and Cornwall.

The landscape of Wales is dominated by the Cambrian Massif, with peaks of over 800 m occurring in the Brecon Beacons, the Black Mountains, at Cader Idris and in Snowdonia, the highest point being the summit of Snowdon at an altitude of 1085 m. Deeply incised valleys penetrate the mountainous terrain, and from the earliest times to the present day, have provided the most significant routes of access, being followed not only by invading Roman armies (Manning 2001, 15-16), but also by the Great Western Railway in its heyday c.1910 (Jarrett 1993, 14-16), and the major elements of the modern road network. The major feature of the Marches is the broad floodplain of the River Severn, with much of the area being less than 200m above sea level and only occasional outcrops of resistant rock such as the Malverns, the Long Mynd, Wenlock Edge and the Wrekin, rising above 400 m. In this area there have therefore been very few obstacles to the development of roads and trackways, with the River Severn and its tributaries (and to a lesser extent the Rivers Wye and Dee) acting as a major waterway from pre-history to the recent past. The limestone ridges of the Cotswolds, Mendips and Poldens run in a general west/east trend, and the Bristol Avon and the Parrett are the major navigable rivers of the southern shore of the Bristol Channel. The northern coasts of Somerset, Devon and Cornwall are dominated by a rocky coastline with the high plateaus of Exmoor, Dartmoor and Bodmin Moor rising up to 500 m; the south-west peninsula juts out into the Western Approaches and is terminated by the cliffs of Land's End.

Tidal streams in the Irish Sea and the Bristol Channel can reach rates of up to eight knots during spring tides, and the Severn Estuary experiences a tidal range of up to 14 m, second only to the Bay of Fundy off Newfoundland. Despite these problems, there is clear evidence for the early use of the sea, as exemplified by a small gold model depicting a sea-going vessel equipped with mast and oars (*Figure* 3.7), made in the 1st century BC and found at Broighter, Co. Derry, Ireland. The ability of recent mariners to "work the tides" is well described by Eglington (1982) in his account of "The last of the sailing coasters". Mackinder (1902) identified two maritime faces of Britain - the ocean margin consisting of those shores lying to the west and north facing the Atlantic, and those lying east and south and facing Continental Europe. He called the area laying between Brittany and southwest Ireland the "marine antechamber" and he described the Irish Sea as the "British Mediterranean". Despite differences in climate, extent and tidal regimes, as a way of understanding the functions of these areas, his suggestions still have much to recommend them.

Changes in the coastal and riverine landscape

As the result of the processes of erosion and deposition, significant changes to the coasts and rivers of Britain have taken place since the Roman period. These are observable today, as at the fortlet at Martinhoe on the North Devon coast, where part of the rampart has slipped into the sea, and at Loughor where part of the fort itself has been eroded. The opposite effect, that of deposition, has led to the silting of the estuary of the River Dee, leaving Chester (the Roman fortress of *Deva*), only reachable today by small craft. Extensive bars of pebbles or sand now obstruct the estuaries of the Rivers Mawddach, Dyfi, Rheidol and Ystwth, causing changes to the river regimes, and affecting access to the known Roman forts at Brithdir, Pennal, Pen Llyn, and Trawscoed. The 3rd century Roman quay (*Figure* 2.4) at the fortress of *Isca* (present day Caerleon) has been subjected to some lateral channel shifting, and is now situated some 230 m from the present-day course of the River Usk, at Roman Gloucester (*Figure* 7.5) there are two periods of water frontage, 100 m or more apart (Hurst 1999, 123).

Changes to the navigability of rivers, as the result of both channel change and variable tidal heights, may take place over a comparatively short time, and must have occurred throughout some 400 years of Roman occupation. There is archaeological evidence from Roman London that the tidal level of the River Thames fell by as much as 1.5 m between the end of the 1st and the middle of the 3rd centuries AD (Milne, 1995, 78-81; Brigham 2001, 15-49). In order to maintain a workable depth of water for lying alongside in order to load and unload, the bases and tops of successive quays were constructed at a lower level than their predecessors (*Figure* 2.3).

Ships, coastal vessels, barges and craft of the period

The title of this chapter deliberately reflects the wide variety of craft, representing different strands of technology that would have been seen on the seas, estuaries, coasts and rivers during the Romano-British period. Much has been written about the types, origins and methods of construction of vessels of the times, but it is not proposed to enter into any detailed discussion of these matters. In order to enable a reasoned assessment of the nature of voyages, on either the seas or inland waterways, the emphasis will be placed on factors such as sea-keeping and passage making

Ships of the Mediterranean tradition were built with the planks fastened edge-to-edge by mortice-and-tenon joints, being watertight without the use of any caulking, and the frames were fastened to the strakes by oak trenails, after the shell of the vessel had been completed. Similar to the Venetic ships described by Caesar (*BGall.* 3.13), Romano-Celtic ships were more heavily constructed, using massive and relatively closely spaced timber framing construction, with the planks fastened to the frames with clenched iron nails. We are fortunate that a number of excavated wrecks in the British Isles are characteristic of this type of craft and method of construction, and are fully discussed in Chapter 3. Seagoing ships are represented by the late 3rd century wreck found off St Peter Port harbour in Guernsey, Channel Islands (*Figure* 3.5) and the Blackfriars Ship of the 2nd century (*Figures* 3.1;3.3), much of this vessel and its final cargo having been recovered from the bed of the River Thames in London. A smaller vessel of the 3rd century, capable of coastal and cross-channel passages (*Figure* 3.12) has recently been found two miles inland from the present foreshore of the Bristol Channel, at Barland's Farm, Gwent, South Wales. The New Guy's Hospital boat (*Figure* 3.14) provides an example of the type of river barge in use during the late 2nd century, probably for trans-shipping from sea-going ships entering the River Thames.

A wide range of "native craft" were in use, for example, simple log boats, made by hollowing out a single log, and shaping the ends and the outside, are known from the Mesolithic, and continued in use in parts of Europe until the 20th century. Various forms developed, such as the Hasholme logboat of c. 300 BC, (*Figure* 3.21) that could have carried a crew of two steersmen and eighteen paddlers, or a cargo of 5.5 tonnes with a five-man crew (Millett & McGrail, 1987). Caesar (*BGall.* 1.12) commented that the Celts used log rafts to cross rivers in Gaul, and two log rafts of the 2nd century AD were recovered from the River Rhine near Strasbourg in 1938 (Ellmers 1972, 106, *Figs*. 83/4). It is probable that rafts were widely used on lakes, rivers and in estuaries; however, it is unlikely that they would have been used successfully on the open sea.

Logistical systems employed by Rome for the supply and provisioning of the Army

The establishment of an effective supply and replenishment system, and using it as a strategic and tactical tool, may be considered one of the major factors in Roman military success. Indeed, Vegetius emphasises this by quoting the military proverb, "Whoever does not provide for provisions and other necessities, is conquered without fighting" (*Mil.* 3.26). The army secured its food supply by various means, the major being requisition or compulsory purchase at a fixed price (*Tac.Agr.* 19.4). The recent discovery, and subsequent decipherment, of the Vindolanda tablets (Bowman & Thomas 1984; Bowman 1994) has made a significant contribution to our knowledge of the problems of supply and demand in northern Britain, and we now have clear evidence that a combination of purchase, requisition and direct production met the basic needs of the Vindolanda garrison.

The Roman army generally did not usually campaign during the winter months of December, January and February (e.g. *Tac.Agr.* 18.1-2). If a war had not ended by the onset of winter, the army would retire into winter quarters (*hiberna*), primarily due to the lack of fodder available for animals, but also because of the difficulties of transporting supplies from a distance.

When possible, the Romans used seaports as operational bases (*App. Hist.* 5.12, 116) and although referring to an earlier period, Livy's description of the operational base used during the Istrian campaign of 178 BC, provides an interesting commentary on the role of water transport in support of the army. "The ships were sent to the nearest harbour in Istrian territory with transports and a large quantity of supplies and ... the legions encamped about five miles from the sea. In a short time a market was established by the harbour, and from there everything was transported to the camp" (41.1.4-6). Tacitus comments that despite the dangers of attack, supplies transported by sea were generally safer than those sent overland (*Ann.* 2.5). Sea transport was routinely used to supply provisions for the army at war and, when possible, a fleet would follow an army marching along the coast, carrying its supplies, including not only grain, but also many other types of foodstuffs, such as meat, fish, vegetables, wine, oil and salt (*Polyb.* 3.97; Anderson 1992, 59).

<u>Roman sea-power and the Classis Britannica</u>

The first mention of a British fleet is by Tacitus, and recounts one of the less glorious events in its history. He comments (*Hist.* 4. 79) that the 14th Legion, was brought from Britain to the Rhine by the "*Britannica classe*", but the fleet became separated from the army, was attacked by a tribe called the Cannifantes and most of the ships were sunk or captured (*classem ultro Cannifantes adgressi sunt maiorque pars navium depressa aut capta*).

The conquest of the Northern Provinces was eased by the development of fleets capable of close support of the army in offensive operations, and equally competent in the transport and supply of the military by waterborne transport. For the whole of the Romano-British period, a major role of the Roman fleet was the transport of military and state personnel, both across the Channel, and around the coasts of Britain. The scale of movement ranged through individual soldiers on posting, to the transfer of complete legions.

Although a relief at Boulogne (*CIL* XII 3564) refers to a *trireme* (*Figure* 5.4), the "Radians", it is probable that the *liburnian* (*Figure* 5.5), was the predominant warship in the Northern Provinces. This type of vessel, described by Appian (3. 3), was used in a variety of roles including conveyance of dispatches, transport of fleet officers and as scouting and patrol vessels (*Veg. Mil.* 4, 37). After the battle of *Mons Graupius*, Agricola reinforced the fleet with troops and gave orders to its commander for the circumnavigation of Britain. The voyage began at a port named Trucculum, but this is otherwise unattested and its location is unknown, although Hind (1974, 285-8) has argued a reasonable case for a location on the Solway Firth. Agricola reports that the Orkneys (*Orcades*) were discovered and conquered and that *Thule* (Shetland or Iceland?) was sighted, but not landed because "winter was approaching" (*Ag.*10). Whatever the accuracy of this report, it demonstrates the ability of the ships and seamen of the Roman fleet to operate successfully in hazardous northern waters - a task that, for example, was to prove fateful for many of the ships of the Spanish Armada.

Naval/military operations in the west of Britain

It has been suggested that the *Classis Britannica* "must have been operating in strength as far north as the Solway Estuary and Tynemouth" (Mason 2003, 98), however, it seems more probable its area of operations was confined to the South and South-east coasts. It is more likely that, in the West, detachments of the navy operated under the direct control of the military commander, as an integrated part of the land forces. Ulpian stated, "in the fleets all rowers and sailors are soldiers" (*Digest* 37, 13) and there is some slight epigraphic evidence to support the close association of legion and naval personnel. At York, where there was an inscription dated c. AD 122, dedicated to a soldier who was described as *gubernator* (pilot) of *VI Victrix* (*RIB I* 653). A memorial from Chester, (*Figure* 5.2) shows that an *optio* of the 20th Legion never achieved his expected promotion to centurion, as he lost his life in a shipwreck.

In his description of Agricola's campaigns in Scotland, Tacitus (*Ag.* 25) refers to units of the fleet being deployed in offensive operations in support of the army, independent operations to "plunder and thus spread uncertainty and terror", and in reconnoitring harbours and landing places. Martin has developed this theme, suggesting that, in AD 82/3, Agricola was able to apply decisive military force "far beyond his northernmost bases" by the use of a synchronised supply service by sea. He also considers that the punitive campaigns of Septimius Severus, and later Caracalla, between AD 208 and 211, were supported by the employment of water transport "on a massive scale", enabling the deployment of overwhelming military force at any chosen point "with despatch and economy" (1992, 1-34).

It is probable that Agricola's experience of combined naval military operations was gained in North Wales. Tacitus records combined naval/military operations against Anglesey by Paulinus in AD 60 and by Agricola in AD 78 (*Ag.* 14; 18). There are clear differences between the campaigns in the North and those in the study area, both in scale and strategic/tactical considerations; these need to be given due consideration. For example, it will be argued that, in contrast to Scotland, the apparent absence of marching camps from the west of Wales (*Figure* 6.8), supports the suggestion of amphibious landings, the establishment of forts and the permanent conquest of territory by sea-power, rather than by cross-country penetration over difficult terrain (*Figure* 6.9).

Naval operations of the later 3rd and 4th centuries were restricted to the operation of isolated detachments of naval vessels, based at the few remaining coastal forts, facing a losing battle in attempting to protect a long and vulnerable coastline. New forts were built at Cardiff and Lancaster, a small fortified harbour was built at Holyhead, there was limited re-occupation at both Neath and Loughor. However, defence of the coastline of western Britain against sea-borne raiders, was a near impossibility, whether attempted by land-based forces, or by ships of the local fleet.

Development of rivers, ports and landing places

There has been considerable research into the navigation of mainland European rivers, and the use of the Ruhr, Rhine, Garronne and Rhone as major trade routes is well attested, but the rivers of Britain have not attracted similar attention. It is clear that the degree of use, even on the largest of the English rivers such as the Thames and Severn, would be less extensive than on their European counterparts. Eckholdt (1984, 3-9) has pointed out that votive reliefs belonging to the shipmasters' guilds indicate that even small tributaries of the major European rivers were included in the Roman water transport system, and it will be shown that this also was applicable to British tributary rivers, such as the Teme and the Lugg. Based on evidence from other parts of the Empire, it will be argued that Roman military engineering was more than capable of improving and maintaining these rivers; thereby establishing an effective system of inland waterways.

By contrast with later periods, Roman law provided legally enforceable constraints protecting the rights of navigation, and this compares favourably with the situation facing the "improvers" of the 17th/18th centuries, who needed to spend much time and effort in pursuing legislation for removal of obstacles, before any work could be commenced. The work of the jurist Domitius Ulpianus, dealt, *inter alia*, with the protection of rights of navigation on inland waterways. The matter is dealt with in some detail in Chapter 7, and clearly gives support to the contention that river navigation during the Romano-British period was not impeded by the weirs etc. that bedevilled medieval navigation. The extent to which this legislation was enforced, or enforceable, cannot be ascertained, however, it does at least show that if an obstacle needed to be removed, it could be done without recourse to the tedious legal processes that made the later improvement of English rivers such a drawn out process.

Writing in the 6th century, the British cleric Gildas was clearly aware of the historical importance of river transport in Britain as he states "It has the advantage of two noble rivers, the Thames and the Severn, arms as it were, along which, of old, foreign luxuries were wont to be carried by ship" (*De Exidio et conquestu Britanniae*, 3). It is clear that, throughout the Roman period, the Severn was a river of considerable importance. Above Wroxeter, the river is fordable at a number of points and the siting of forts on the riverbank upstream of this point is probably a reflection not of a defensive strategy, but rather an indication of the use of the navigable potential of the river. The Wye, Usk, Avon, Parrett, Dee, Conwy were also rivers with significant traffic, and forts were located on the estuaries of rivers such as the Seiont, Tywi, Dwrd, Dyfi, Llugwy and Ystwth.

The demand for an efficient system of water transport existed. Clearly, it would have been necessary to carry out a system of riverbed and bank maintenance, clearing the river of obstructions and maximising the depth of available water and Roman engineering would certainly have been capable of these tasks.

Cargoes and cargo-carrying capacities

In many cases, water transport would have provided the most obvious form of transport for bulk consignments of grain or heavy items such as amphoras (or barrels) containing olive oil or wine. Large pieces of decorative stonework were used extensively in public buildings, villas and forts. For example, limestone was shipped from the Cotswolds and the Mendips to the town of Kenchester, via the Severn Estuary and then the River Wye. Cheshire sandstone reached Caernarfon via the River Dee and the North Wales coast and, in the upper reaches of the River Severn, sandstone used in the fort at Caersws had been transported some 25 km upstream, from the Welshpool area.

Although the valleys and plains of the study area would have been capable of satisfying the areas demand for grain for the civilian population, it is probable that in the early stages of conquest and consolidation, most of the grain for the army would have been supplied from the Cotswolds and southern Britain. Salway (1981, 618-20) considers that, at this time, Roman Britain may have been an exporter of grain. Occasional importation from further afield is indicated by a large quantity of charred grain, probably comprising a single consignment, found inside a London shop, probably burnt down in AD 60-61, and seeds of plants mixed with the grain indicate that the crop had been growing in the Eastern Mediterranean (Straker 1987, 151-5). It seems probable that this reflects a bad harvest in Britain that year, as it is otherwise difficult to understand why this consignment had been shipped from such a distant source.

The products of the extractive industries of iron, tin, copper and lead were particularly suited for movement by water transport; and the iron blooms produced on the Severn Estuary sites were, because of the weight factor, ideally suited for movement up-river to Gloucester and beyond. There are significant mineral deposits in North Wales, with important silver-lead ores being found in Flintshire, with copper ore on Anglesey and the Ormes, and evidence of Roman mining has been found at these locations. The fort at Caernarfon (*Segontium*) remained in use until the end of the 4th century; continued occupation over such a long period is attributable not only to its strategically important position, but also to a function as an administration and collection point for the products of the mines. The Mendips provide an excellent source of silver-lead ore that was mined from the earliest period of the conquest. Recent excavations have demonstrated major Roman processing of the iron ores of Exmoor and, though evidence is hard to find, it is difficult to believe that the rich mineral resources of Cornwall and Devon were not exploited.

Waterways and roads

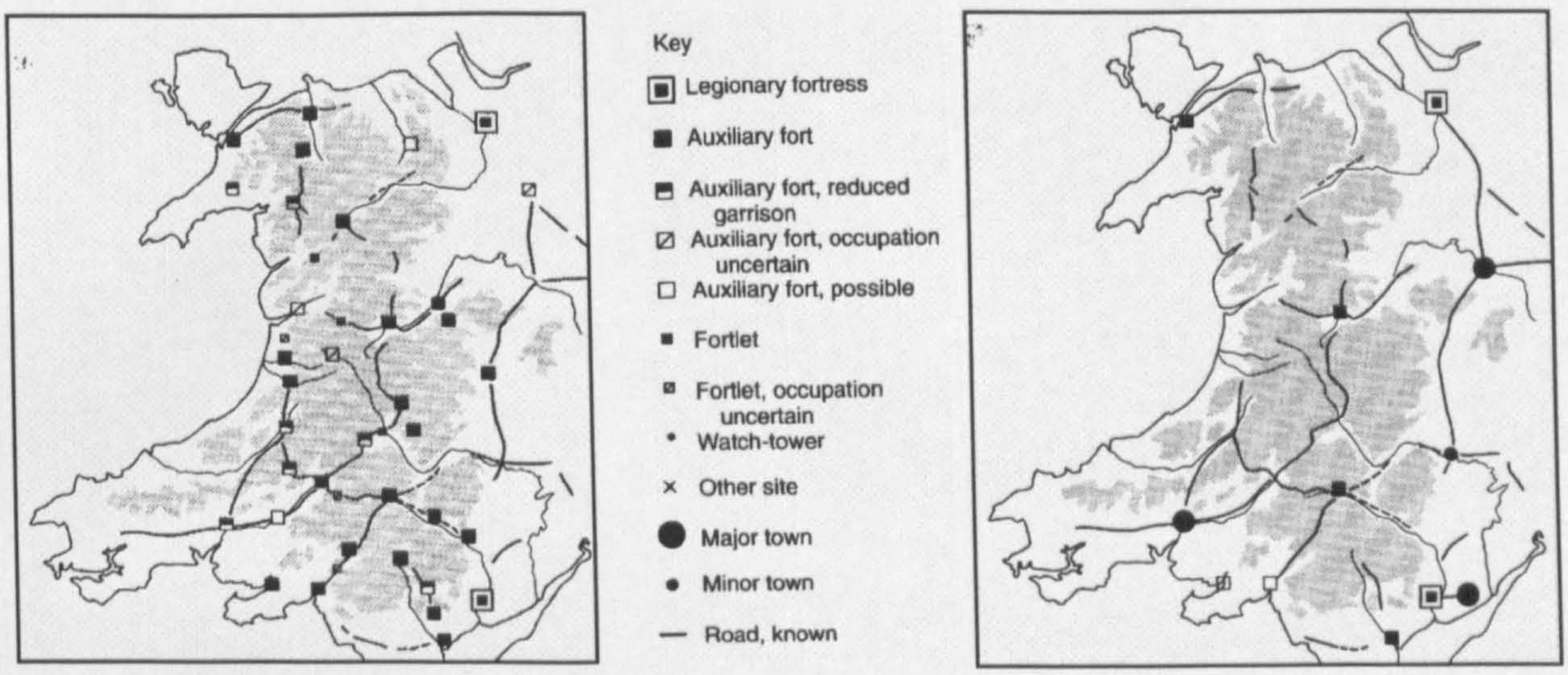
There is considerable evidence for Iron Age trade with Britain via the Western Seaways. For example, Strabo (1, 14; 5, 2; 3, 4), Ammianus Marcellinus (27, 8) and Caesar (*B.Gall.* 2, 4) provide much information. The voyage of the navigator Pytheas has been examined by

Cunliffe (2001), and McGrail (1990, 36) has commented on the early 6th century *Massaliote periplus*. However, it is clear that Fulford was correct in stating that "the conquest of Gaul marked the beginning of a permanent shift in the direction of trade; the longer and more dangerous west coast of routes appear to have declined as internal routes and markets within Gaul became secure" (Fulford 1991, 36). Following the opening of the Continental inland waterways, fewer ships used the Western Seaways *en route* to the Irish Sea than previously but, in some instances, this decline may have been over-exaggerated. The majority of Spanish oil was shipped through the Straits of Gibraltar to either Italy for direct consumption, or to Marseilles for onward shipment via the Gaulish river and road systems. However, it will be suggested that it would have made sense, for at least the western British component, to be shipped direct via the Atlantic route (*Figure* 10.7). The case for this, as a cost effective alternative, will be made in some detail. It will also be suggested that "the dangers of the west coast route" (Fulford - above), and the perils of Land's End (e.g. McGrail 1985, 16; Holbrook 2001, 152; Peddie 1997, 137-450) are much exaggerated, and that there is considerable evidence that voyages, under sail, round the Southwest peninsula are not the difficult undertaking suggested by these writers.

A wide range of ships and boats were available during the Romano-British period, and were clearly capable of meeting all water transport needs, both civilian and military, on the open seas, estuaries and inland waterways. The sea-going and cargo-carrying capabilities of these vessels display similar characteristics to those of much later periods. For example, the Blackfriars 1 ship (*Figure* 3.1), the St Peter Port ship (*Figure* 3.5), the ships of the Veneti (*Figure* 3.8) described by Caesar (*B.Gall.* 3.13), and the medieval "cog" have much in common in terms of design and construction, and display similar sea-keeping, passage-making and cargo carrying capabilities. It is therefore suggested that the study of more recent maritime activity, when documentary evidence such as "Port Books" becomes available, is of considerable value in determining the possible patterns of shipping during Romano-British times.

In the study area, many forts and settlements are located on the coasts, estuaries and navigable rivers (*Figures* 9.7; 10.1-5), and therefore provide an excellent case for supply by water transport. Of the 66 sites in the study area, 51 are on potentially navigable waterways; only 15 are unlikely to have been supplied directly by water transport (*Figures* 10.16-17). Wales, in particular, lends itself well to this method of provisioning, because of its long coastline, the isolation of the forts and the lack of an effective road system during the early campaigns. The role of the *Classis Britannica*, both in offensive operations and in supplying logistical support for the army, is discussed in Chapter 6, the types of boats and crafts that may have been in use are discussed in Chapter 3.

When engaged in full-scale warfare it is unlikely that the question of cost, or cost-effectiveness, would have played a significant part in planning military operations. However, during the lengthy period of peace in the area, it may well have been that this became an important consideration in the methods of supply and replenishment. Clearly, water transport played a significant role in the movement of troops and the supply of equipment and rations, throughout the whole of the Romano-British period, but the amount of traffic varied dramatically over time and space, in direct proportion to the number of army units in the study area (Figure 1.1) and this topic is fully discussed in Chapter 10.



c. AD 100 - 120 *c. AD 260 - 300*

Figure 1.1. The Roman Army presence in Wales, the Marches and the Bristol Channel (J.L. Davies)

The Roman roads of Britain were initially constructed as essential lines of communication and routes of supply for the campaigning army, and this remained their primary function throughout the Romano-British period. Whilst civilian use was permitted, this was carefully regulated, as is demonstrated by the weight restrictions imposed by the *Codex Theodosianus.* Despite the (generally) high standard of Roman roads, there is a clear cost advantage in transport by water. Duncan-Jones (1982, 366-9) used the pricing edict of Diocletian to suggest a ratio of 1: 4.9: 28-56 for the relative costs of sea, inland waterways and road transport. In the case of long distance transport, the relationship between the weight and bulk of goods and their value is critical. Transport of weighty and bulky goods of low value by land is extremely expensive, but the significantly lower cost of carriage by water makes the task economically viable. At Bath, during the 18^{th} century, Tyne coal, coming 400 miles by sea and river, undercut Mendip coal that only travelled 12 miles by road. Weighty and bulky goods of high value, on the other hand could stand the cost of expensive land carriage even over long distances, and the classic examples of this are cloth and wool (Willan 1976, 1-9).

Population, demand and volume of shipping

An early estimate by Collingwood and Myers of one million as the population of Roman Britain (1937, 180) has been subject to significant upward modification [c. 3 million (Fulford 1984, 131); 4-6 million (Salway 1981, 544)]. Millett (1990, 181-6) arrived at a mid-range figure of 3,655,000. As this thesis is concerned with the volume of transport by sea and river, it is essential to attempt an assessment of consumer demand, based on social groupings. Despite considerable research, (including seeking the advice of specialists in ancient history, as well as Roman archaeologists), it is clear that this is an area that has received little attention, and a first attempt is therefore made to address this question.

Change over time is significant and, for example, the variable pattern of military demand is well demonstrated by the series of maps by Jones and Mattingly (1990, 103-50) and reproduced here as Figures 10.1 – 10.5. These clearly illustrate the increasing, and then decreasing, numbers of occupied forts in Wales, and therefore a consequent variation in the demands of supply and replenishment, whether by water or road transport. Changes in taste, and the desire for Roman "luxuries", such as Italian wine and Spanish olive oil, show similar variability of demand, rising in the early period of occupation, falling by the 4th century to a fraction of the earlier volumes.

As was the case with population, an exhaustive search of published material to recover details of the volume of shipping on the coasts and rivers was unsuccessful. This indicated a topic that had been largely ignored, not only for the study area, but also for most of Roman Britain. Important exceptions are Marsden's assessment of the number of shiploads of Kentish rag stone needed to construct the city walls of London (1994, 80-84), the study by Allen and Fulford (1999, 163-83) of the supply by sea of building stone to the Saxon Shore forts, the sources of building materials in Roman York (Gaunt and Buckland 2003, 135-43), and Fulford's (2000, 41-50) examination of the organisation of support for the Claudian invasion of Britain. These studies are, however, based on specific events and comparatively confined geographical areas, and it was decided to attempt to quantify the volume of shipping by creating a model of demand for those commodities, that would be applicable at any time, or to any geographical location in Roman Britain.

Conclusion

There were significant changes in the coastal and the riverine landscape during the Romano-British period. However, there is archaeological evidence that Roman engineering was capable of dealing with problems created, for example, by changes in sea-levels and tidal regimes. Whilst post-Roman changes have been more wide ranging, they have not altered the landscape to such an extent of that it is unrecognisable, compared to Roman times, and valid similarities may therefore be observable.

Rome had a significant maritime presence within the Mediterranean, together with a century's experience of the conditions of the Atlantic coasts of Hibernia and Gaul, and Romano-British vessels would not suffer by comparison with the vessels of the early medieval period, where documentary evidence indicates a wide-ranging maritime economy. The Roman army was proficient in all aspects of supply and replenishment; its logistical systems were not improved upon until the early 19th century. The Roman fleet supported the army in both the transport of supplies, close support of military operations and, it is suggested, in amphibious landings on the coasts of Wales.

Although best known for its system of roads, the Romano-British period saw the development of a coastal and riverine transport infrastructure that was not equalled until the advent of the Canal Age in the 18th century. A combination of legislation, and the availability of a cost-effective the water transport system, meant that the roads were available for their primary task, i.e. the movement of military personnel and supplies.

As would be expected, during the course of a period covering some 400 years, the patterns and directions of trade and commerce changed in response to both military and economic factors, and ports, landing places and the use of rivers, changed in a corresponding manner. It is hoped that an analysis of these factors, in combination with an extensive database of locations accessible by water transport, will enable a realistic assessment of the volume of shipping during the Romano-British period.

Chapter 2. Changes in the coastal and riverine landscape

Introduction

Even the most superficial study of Roman coastal and riverside sites will indicate that significant changes have taken place since they were built. The effects of coastal erosion may be clearly seen at, for example, the Saxon Shore fort at Reculver where, as late as AD 1600, the cliff top lay 600 m to the north, but now approximately one-third of the fort has been destroyed and lies underwater at high tide (*Figure* 2.1. - left). The opposite process, that of deposition, is clearly demonstrated only 15 km distant, at Richborough, often considered as the beachhead for the Claudian invasion of AD 43, where the Wantsum Channel silted up, leaving Richborough some 5 km distant from the modern coastline, and joined by land to the former Isle of Thanet. The subsequent deposition of a bank of shingle to the north of Richborough forced the River Stour to find a different course to the sea, via a substantial southern loop, which took it past the eastern edge of the fort at Richborough, eroding away part of the fort in the process (*Figure* 2.1. - right).

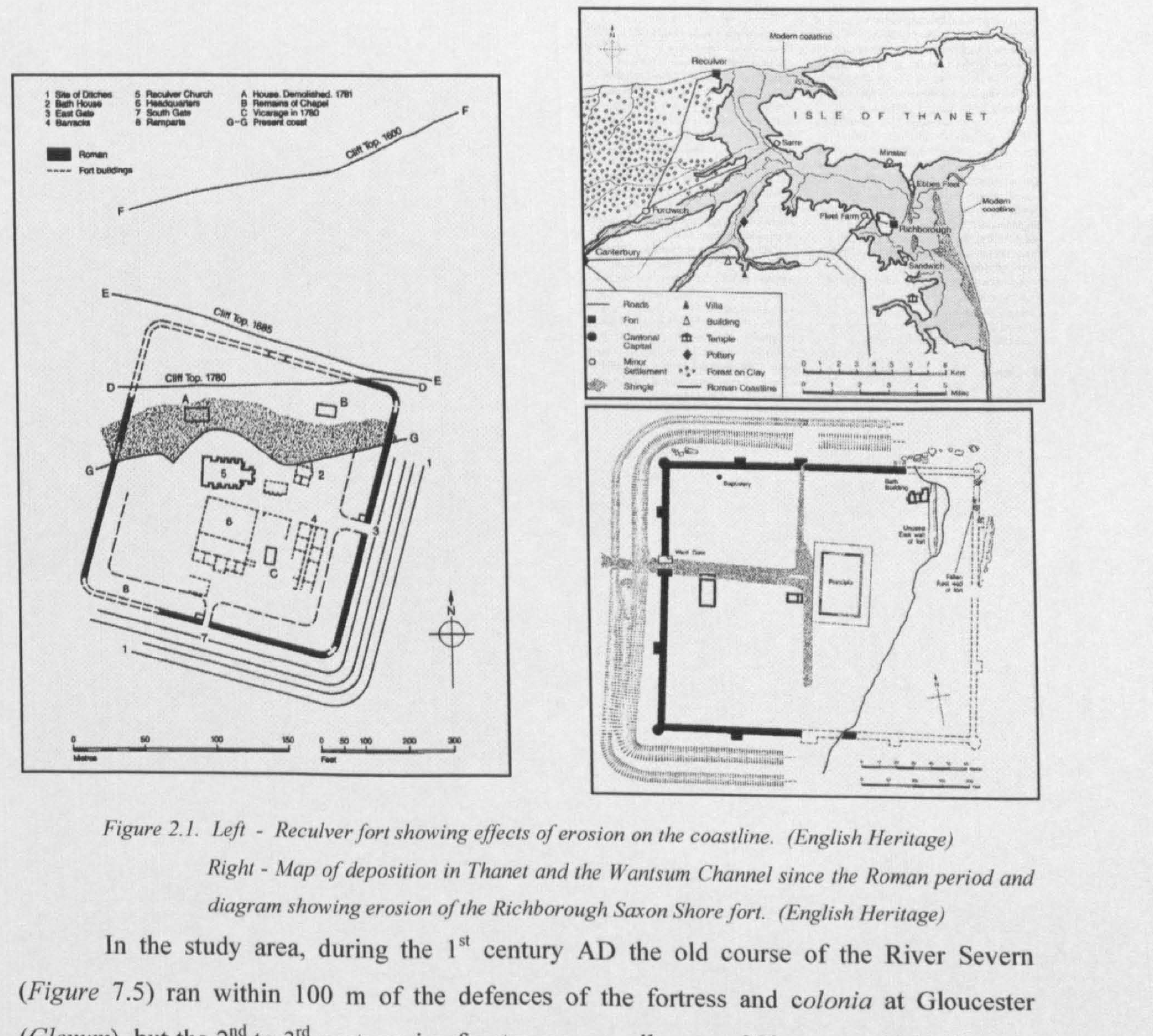


Figure 2.1. Left - Reculver fort showing effects of erosion on the coastline. (English Heritage)
Right - Map of deposition in Thanet and the Wantsum Channel since the Roman period and diagram showing erosion of the Richborough Saxon Shore fort. (English Heritage)

In the study area, during the 1^{st} century AD the old course of the River Severn (*Figure* 7.5) ran within 100 m of the defences of the fortress and *colonia* at Gloucester (*Glevum*), but the 2^{nd} to 3^{rd} century riverfront was generally some 250 m west of the fortress.

By the 12th century, the distance had become 450 m (Hurst 1986, 1-3); this sequence of events is dealt with in some detail in Chapter 7.

Sea levels and coastal processes

At the end of the last glaciation, some 10,000 years ago, the ice sheets melted and the volume of water in the oceans increased, resulting in a rise in sea level, termed isostatic change. In the British Isles, the most dramatic effect was the submergence of Dogger Land in the North Sea, and the separation of England from France by the creation of the English Channel. However, the absolute height of the sea surface is not the only factor involved in coastal change, as the land surface is also changing in different directions, and in different parts of the country. Shorter to mid-term local and regional changes in sea level are caused by oceanographic factors, such as changes in ocean temperature and shifts in ocean currents; meteorological factors including changes in air pressure and winds; the magnitude of frequency of storms; and hydrological factors such as changes in tidal regimes and river discharge.

River and stream processes

Allen has commented that "To the geomorphologist and sedimentologist, the most interesting feature of a river is that it expresses a movement of water, solutes, and sediment from the land to the oceans, as a direct consequence of which the structure and form of the land and its margins are altered through erosion and deposition as the river itself changes character" (1977, 16). Two types of pattern may be distinguished, i.e. autogenic, which are those inherent in the river regime and involve channel migration, meanders, cut-offs, crevassing, etc, and allogenic, which occur in response to changes involving, for example, climatic fluctuation or altered sediment load or discharge, perhaps as a result of human activity. Man induced channel changes are of two basic types - direct and indirect. Direct changes are those brought about by some generally purposeful human action on the stream channel, generally related to engineering schemes intended to alleviate existing or impending threat of flooding, sedimentation or erosion. Indirect changes are brought about by the effects of human activity on the processes that control stream channel flow. These changes may be the result of many different causes, and the various human environmental impact on drainage basins include afforestation and deforestation, inter-basin water transfers and the effects of road construction and urbanisation (Park 1977, 121-144).

Rivers may be defined as straight, meandering, or braided, with some having a well-developed sinuosity whereas others are only slightly winding. Although the course of a river may appear to be straight, the deepest points on the channel (the thalweg) display a degree of sinuosity and although the banks of a river may be straight, the flow of water between them is not. However, very few rivers have a straight-walled reach for any distance. A meandering river may flow within a winding channel defined by valley walls, or it may have a channel with very contorted bends sprawled across a flood plain. Braiding is the division of a single channel into two or more anastomosing channels. Many rivers exhibit each of these three channel patterns (straight, meandering, or braided) somewhere along with their length.

<u>*Sedimentological and archaeological evidence for change*</u>

Brown (1997, 225-6) has drawn attention to evidence from several areas of Britain that show an increase in flooding and alluviation during the Romano-British period. At Fengate, near Peterborough, there is evidence of alluviation, with the lower part of the site being covered by Roman freshwater clays and from the sedimentary evidence, it has been concluded that there was freshwater flooding in the later part of the 2nd and 3rd centuries. Roman alluviation has been identified at Braughing in Hertfordshire and, moving further north; there is evidence of late and post Roman flooding in York, Brough on Humber and Watercrook in Cumbria.

The location of structures such as quays, bridges, weirs and settlements indicates evidence of mobility in the flood plains of large rivers, such as the Thames, Trent and Severn, and suggest that there was little major channel change during the Roman and medieval periods. The entire lower Severn has been plotted, using 1st edition Ordnance Survey maps of the 1830s and 1840s, and these have been compared to modern maps using fixed ground control points and the conclusion reached was that only limited little lateral channel change has occurred during the last 150 years (Brown 1997, 225-9). Clearly, there was change during the period, but this appears to have been restricted to alterations in the number and dominance of channels where there was a multi-channel system. There is evidence of some limited lateral channel shifting, for example the Roman quay at the fortress of Caerleon (*Figure* 6.4) is 150 m distant from the present course of the River Usk (Boon 1978, 24-36); at the villa at Park Farm near Lydney, the remains of the Roman quay are approximately 40 m to the east of the present channel (*pers. obs.*).

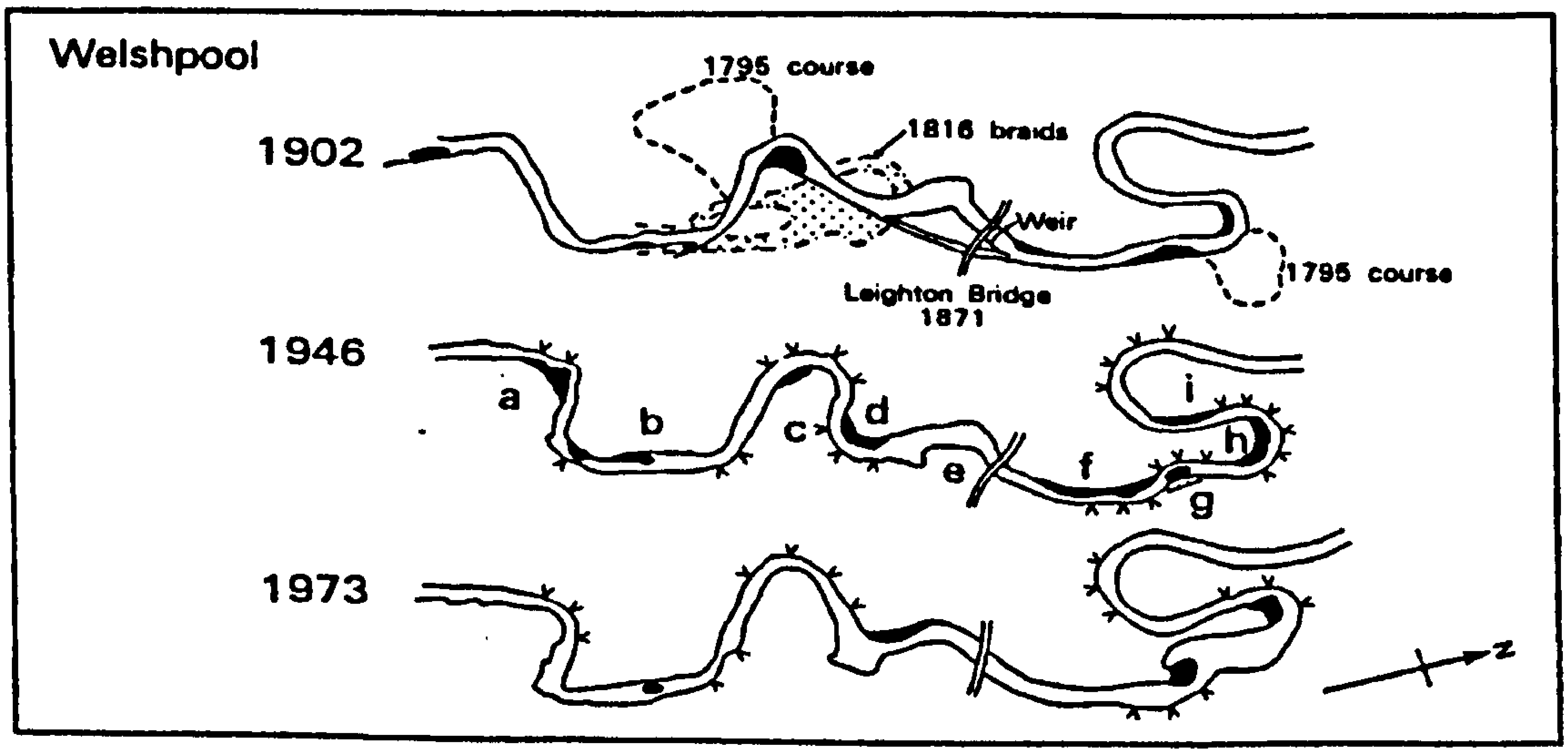


Figure 2.2. Historical channel changes from the River Severn at Welshpool (Lewin).

The River Severn appears to be significantly less laterally stable as the piedmont zone, close to the Welsh mountains, is reached, and significant channel change (*Figure* 2.2) at Welshpool has been demonstrated (Lewin 1987, 161-70); the River Vyrnwy, a tributary of the Severn, also displays post-Roman incision and active migration over the past 200 years (*ibid.* 1992, 103-110).

Extensive bars of pebble or sand now obstruct the estuaries of the Rivers Mawddach, Dyfi, Rheidol and Ystwth, consequently causing changes to the river regimes, and affecting access to the known Roman forts at Brithdir, Pennal, Pen Llyn, and Trawscoed. The site of the supply depot at Rhyn Park is on a flat plateau on the southern side of the deeply cut valley of the Afon Ceirog (a subsidiary of the River Dee) with northern defences originally lying close to the lip of the valley. However, erosion of the valley edge has caused the entire northwestern corner, and about half of the length of the rampart and ditch to the west of the Northgate, to disappear (Davies 2000, 8).

Recent work in the Severn Estuary (Allen 1990, 13-28; 1991, 485-94) has shown that, since the Romano-British period, a rise of c.1 m in sea level has resulted in much of the land reclaimed with sea defences, constructed by the 2nd Legion (stationed at Caerleon), now being lost within the mud flats of the tidal foreshore. In the Somerset Levels there is considerable evidence for a widespread marine transgression during the Late to Post-Roman period, and it is probable that flood-water levels extended up to 10 km inland, burying both reclaimed and un-reclaimed Roman landscapes under up to *c.*0.7 m of alluvium. Recent paleoenvironmental work has established that the marine transgression resulted in the establishment of brackish conditions, over what had been a freshwater landscape (Rippon 2000, 138).

Determination of tidal heights and sea levels by archaeological evidence

Given that settlement sites must have been above the maximum reach of contemporary sea levels, it is possible to determine some of the most obvious indications of changes in sea level and coastal topography. For example, from the presence of archaeological sites now in the inter-tidal zone of the Scilly Isles, Thomas (1985) has suggested that a rise in sea level resulted in the partial inundation of a single mass resulting in the present group of islands. He argues that this single land mass existed until at least the end of the Roman period and became separate islands between the 11th and 15th centuries as the result of a rise of the sea level of approximately 4 m since the Roman period.

The archaeological remains of ports and harbours that exist on coasts, estuaries and rivers may be dated by the associated ceramic, numismatic or epigraphic evidence, and provide a useful tool in determining the highest sea levels that existed during the Romano-British period. As accurate records of present day levels are available from the Admiralty Charts produced by the Hydrographic Office, it is possible to establish changes that have taken place since that period, and therefore understand with greater accuracy how the coastal and riverine landscape has changed over time.

Evidence from Roman London indicates that significant tidal level change took place during the Romano-British period, and that this had an immediate effect on both navigability and waterfront development. The earliest evidence for waterfront activity from London is the construction of a timber quay near to the area of the present City of London, the height of the quay indicates that the level the river was expected to reach at high water was c.1.2 m OD. Following the Boudiccan sacking of *Londinium* in AD 60, reconstruction of the area was undertaken and a further timber quay of a similar height was built near to the present London Bridge. The tops of new quays constructed in the early 2nd century were 0.5 m lower than the earlier structures, in an apparent response to a fall in the river level of the Thames. A progressive fall in river level in the second and third centuries required the continual extension of the waterfront in an effort to maintain a workable depth of water for shipping (Brigham 2001, 15-49). Milne (1995, 78-81) has pointed out that excavations of waterfront construction from AD 70 to 250, in the area of the present City of London, indicate that both the base and the top of each successive quay were made at a lower level than its predecessor (*Figure* 2.3). This indicates that the level of the Thames fell by as much as 1.5 m between the end of the 1st, and the middle of the 3rd century. Because of this, the tidal head must have moved downstream and, at some point, sea-going ships would have been unable to use the London waterfronts as, even with the extended quays, insufficient water would have been available for them to dock.

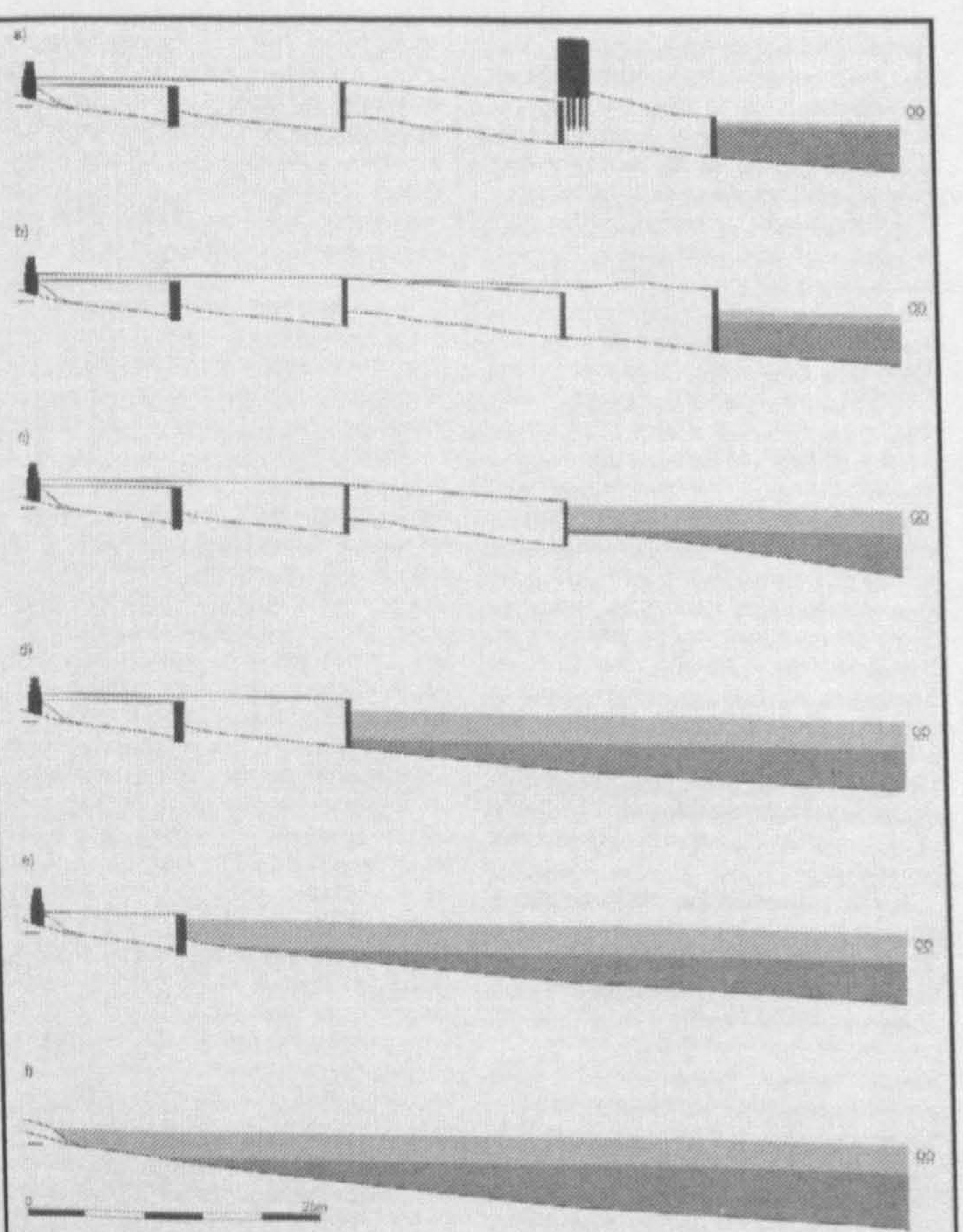


Figure 2.3 Diagram showing Roman waterfront development from the 1st to 3rd centuries. (Milne)

Excavations in 1963 at the legionary fortress of Caerleon, situated on the tidal River Usk, 14 km upstream of its confluence with the Severn Estuary at Newport, revealed a 3rd century stone-built Roman quay, lying some 230 m from the line of the present riverbank (Boon 1978, 24-36). The height of the hard standings behind the quay ("G" on *Figure* 2.4) was, on average, 6.56 m above Ordnance Datum (the Mean Sea Level as calculated by the Ordnance Survey at Newlyn in Cornwall), with the present ground surface ("N" on *Figure* 2.4) lying at about 0.6 m above the quay. The maximum height to which sea level may be predicted to rise at any point is that of the Highest Astronomical Tide (HAT) and, at the present time, Newport Docks are at 5.81 m above Ordnance Datum (OD), with Caerleon lying 10 cm higher, and the HAT is 7.69 m OD at Newport and therefore 7.79 m OD at Caerleon. At any time, a top of a quay would need to be above HAT, to ensure that any goods stacked on it were not damaged, and to prevent vessels being washed onto it as a result of storm surges, and it is probable that a height of 1 m above HAT would be needed. This therefore indicates a HAT at Caerleon of 5.6 m OD during the 3rd century, and therefore suggests that tidal levels some 1 m below those of today, and this appears to be supported by the subsequent deposition of sediment on top of the hard standings of the quay ("H. J and M" on *Figure* 2.4).

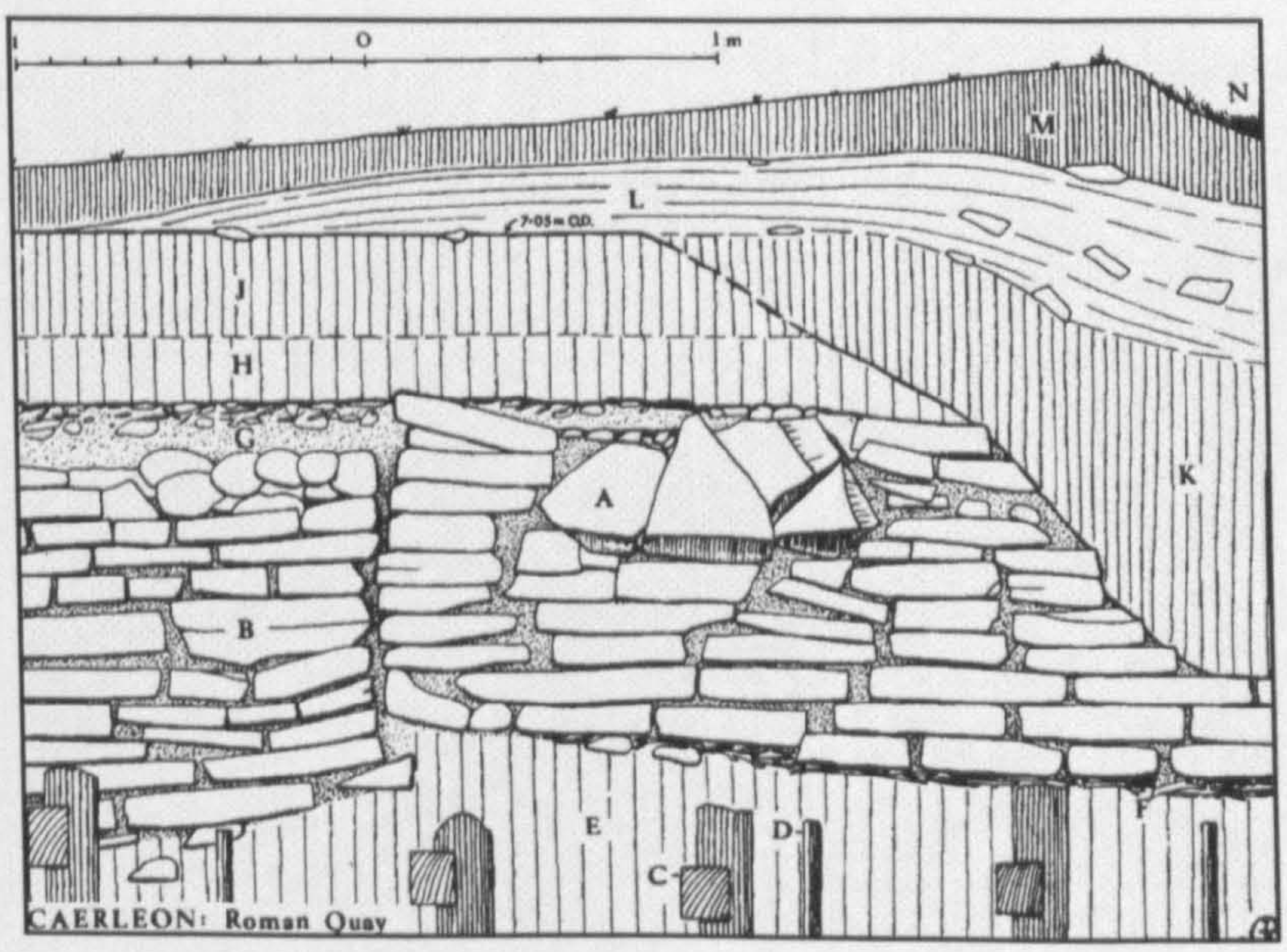


Figure 2.4. Elevation of the 3rd century quay at Caerleon (Boon)

The suggestion of a major marine transgression on the Somerset Levels in the 3rd and 4th centuries AD was originally proposed by Godwin, whose theory was based mainly on the finding of Roman material at depths of up to 2 m at Highbridge, and the evidence of briquetage mounds found during the cutting of the Huntspill River in the 1940's. The proposition became generally accepted, for example, Finlay (1965, 17) refers to "a marine transgression dated by archaeological remains at about 25O AD". Cunliffe also accepted the hypothesis, and from pottery evidence suggested that occupation at Highbridge had ceased by the end of the 2^{nd} century, and that "floods of increasing severity and extent gradually drove the local inhabitants further inland during the course of the third century". His comments on the economy and society of the area are difficult to accept, as he suggested a "massive movement of population" from an area which today, even with modern drainage systems, is sparsely populated, other than in the coastal holiday area. (1966, 69-73).

Hawkins has since argued that the present sea levels were attained by the end of the Neolithic period and that there was no major Roman marine transgression (1973, 75-85). He considered that the estuarine clay that seals the Roman material was the result of deposition to the maximum height of High Water Spring Tides in the equinoctial periods. He accounted for the varying depth of finds of Roman material as being the result of the consolidation of the underlying peat and/or the deposition of broken pottery and other debris in tidal pills. Leech (1979, 25-26) considered that the archaeological evidence strengthened Hawkin's main points, but indicated that some of his detailed conclusions required modification. Estuarine clay levels revealed at Burnham-on-Sea and Badgworth, led him to conclude that the accretion of the coastal clay belt was a continuing process before, during and after the Roman period.

At Chester, Waddelove and Waddelove (1990, 253-266) drew attention to a report that, during the construction of a gas-holder in 1890, "An ancient river wall was found, about 17 feet from the present line of the river, built of large blocks of sandstone, at an angle of about 45 degrees, starting from what was no doubt the original bed of the river. The wall had no foundation, and was built without mortar. A flight of steps led from the top of the wall to the bottom" (Hunter 1897, 81). Waddelove and Waddelove calculate that the height of the wall was at 2.34 m OD (Ordnance Datum) and suggest that the contemporary HAT (Highest Astronomical Tide) appears to have been no higher than 2.03 m OD when allowance has been made for a safety margin. Whilst commenting that this height "is considerably more than the figure of 1ft. 2ins actually recorded by the present authors", they suggest that, from their calculated Roman HAT, there has been a rise in the Dee of at least 3.68 m. They go on to suggest, "A picture could be emerging of an early Flavian quay or wharf fronted with timber, adjoining a sloping stone revetment which was also the landing stage for a passenger ferry" and that sea-going vessels would have needed to off-load at Meols for shipment by lighter to *Deva*. However, Ward (1996, 8) draws attention to the excavations during 1976-8 indicating that that a site on the northeastern bank of the river at Shipgate Street showed early Roman occupation at the level of 5.6 m OD, and that the latest Roman occupation level lay at 6.3 m OD. He points out that this is at variance with the interpretation of Waddelove and Waddelove, where the Roman water level is considered to have been much lower than the present one. Moreover, he comments that there is no evidence that the wall discussed in their paper was Roman in date (he considers that an early post-medieval date might be preferable), nor that its surviving top, as recorded, represented its original total height. During the excavations of 1885 a grave was found, with a floor level at c. 3.5 m OD, that included the skeletons of an adult and a child, and amongst the grave goods was a coin of Domitian (81-96); Mason points out that this must obviously have been dry land in the early Roman period (2002, 68). He suggests that, together with the evidence from more recent excavations near the Old Dee Bridge, even the highest tide in the Roman period "is unlikely to have reached a level over 4.5 m OD. Ordinary tides may have averaged around 4 m, receding to 1.5-2.0 m at the ebb". In any case, it was the general practice in Roman Britain, wherever possible, to site a permanent fortress within the navigable tidal limits of river, thereby enabling sea-going vessels to transfer their cargoes without the need for lighterage, and this alone may suggest that the Waddelove and Waddelove interpretation is open to question.

Change may take place over periods ranging from hundreds of years to matters of hours, and Everard has pointed out that along an irregular coast (as is the Welsh coastline) the mean sea level surface is extremely sensitive to alterations in the form of the shore, the depth of the tidal channels and other shore features, and that changes can cause local fluctuations in measured mean sea level "ranging from fractions of an inch to one or two feet" (1980, 6). Therefore it is clearly unhelpful to attempt a generalisation for the 400 years of Roman Britain, or for an area as large as Wales, the Marches and the Bristol Channel.

Conclusion

It has been shown that the effects of erosion and deposition are important, may make significant changes to coastal and riverine landscapes, and that these two processes are interdependent. This is particularly well illustrated in the study area, where the site of Iron Age/Roman *emporium* at Meols, still existent in the mid-19th century (Hume 1863), has now been eroded and lost to the sea, with the resultant sediment being deposited in the Dee estuary. As a consequence, the Roman fortress of *Deva*, later to become the important medieval port of Chester, is now isolated from the sea, for all but the smallest of pleasure craft. In addition to the changes in the geomorphology, rendering interpretation of the Roman period landscape a matter of some conjecture, a further consequence is the loss of archaeological evidence. This is of major significance in the case of riverside structures not usually, other than at major ports such as London (*Londinium*) or Dover (*Dubris*), of sufficiently massive construction to withstand the abrasive effects of the currents, and therefore having long disappeared. On the other hand, the effects of channel change and deposition may bury such structures under layers of sediment, and render their discovery a matter of either chance or, as in the case of the quay at Caerleon, determined archaeological investigation.

It is therefore of prime importance to attempt to place any interpretation of Roman water transport in the context of what (probably) existed at that time, not in the landscape that we see today.

Chapter 3. Ships, coastal vessels, boats and local craft of the period

Introduction

This thesis is primarily concerned with the vessels themselves, the voyages made and cargoes carried, rather than the methods of vessel construction (varied and interesting though they may be). Therefore, in this chapter the descriptions of vessels, for which we have archaeological, epigraphic or written evidence, are divided into sections dealing with vessels that plied the "Seas and coasts" and those normally working on the "Estuaries and rivers". This division results in what may, at first sight, appear as unlikely combinations, for example, the skin-covered native curragh appears alongside the Blackfriars 1 ship of heavy planked construction. In a similar manner, the County Hall ship, of Mediterranean type construction, finds itself in company with the lightly built coracle. Clearly, such a broad classification is open to criticism – for example, a vessel similar to the Barland's Farm boat could have travelled far up the Rivers Severn or Wye, conducted regular trips across the Severn Estuary and Bristol Channel, or made a successful passage to Ireland.

At one end of the spectrum are ships such as the St Peter Port ship, archaeologically demonstrable to have been engaged in trade along the French Atlantic coast and at the other, the numerous small craft on the coasts and rivers. These would have been employed not only for fishing and local transport, but also for transporting goods up-river from larger coastal and sea-going vessels. The well-excavated and reported remains of some, such as the Hasholme logboat and the Brigg "raft", survive in the archaeological record, and are from an earlier period, but their descendants continued in use during the Romano-British period and are therefore described below. Others, such as the various forms of skin-covered craft, do not survive, but are recorded by classical writers in sufficient detail to provide evidence of their form and function.

The types of naval vessels used on the coasts and estuaries of Britain are discussed in Chapter 5, but as no archaeological evidence for a Roman navy ship has been found, written and epigraphic evidence are the main sources of information. The structure of the *Classis Britannica,* and the probable methods of operation in the study area, are also considered in that chapter.

Throughout this chapter, extensive use is made of model reconstructions and illustrations from reliable sources, e.g. The National Maritime Museum at Greenwich and the Museum of London. Whilst it is realised that reconstructions, necessarily based on limited evidence, cannot be expected to display absolute accuracy, it is considered that their inclusion is justified, particularly because of the impression given of the <u>size</u> of vessels of the period.

Ships of the seas and coasts

Blackfriars ship 1

The wreck of the 2nd century AD Blackfriars ship lay in the bed of the River Thames, about 120 m from the Roman shoreline, off the southwest corner of the city of *Londinium* and was excavated, in advance of building construction, in 1962-3 . The wreck comprised the bottom, and parts of the collapsed sides, of a Romano-Celtic merchant vessel about 18.5 m length and 6.5 m beam. The vessel was built entirely of oak and, instead of a keel, had two broad keel-planks, with the stem-post and stern-post remaining *in situ*. The frames were attached with iron spikes 0.6 m long to the planks, laid edge-to-edge, which formed the shell of the boat. Each spike had been driven through the planks and frames, and then turned over on itself (known as clenching). Between the strakes was a caulking of hazel shavings in a pine resin.

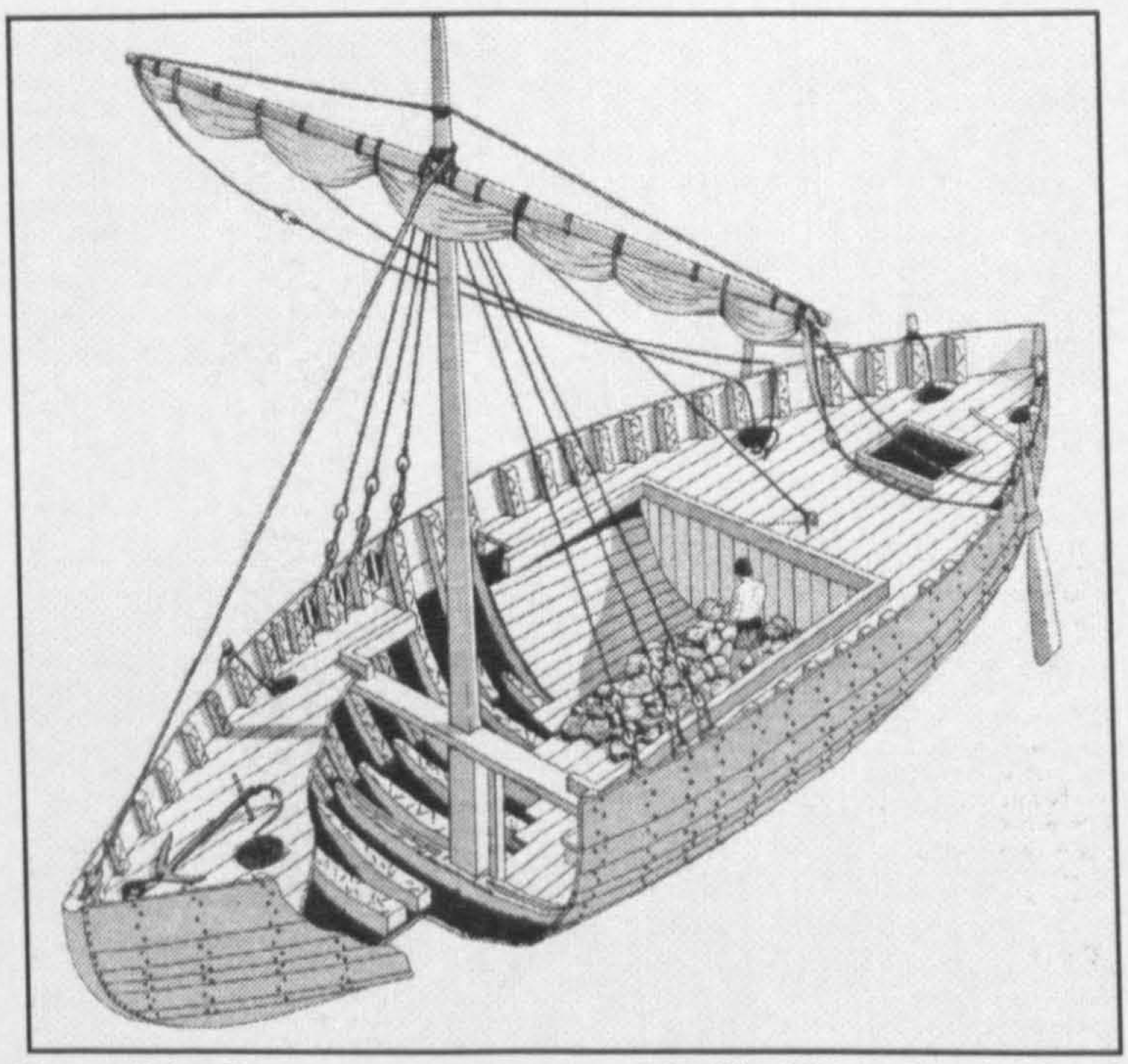


Figure 3.1. Cut-away reconstruction of the Blackfriars ship 1 (Marsden)

Dendrochronology suggests felling of the timbers between AD 130 and 175, but the absence of sapwood prevented a more precise dating for the construction of the ship. There was no evidence of any major repairs, little or no rot was observed, infestation by marine borers was minimal, and it is therefore clear that the vessel had been only in use for a very limited period before sinking. A bronze *as* of the Emperor Domitian, minted in Rome in AD 88-89, was found in a recess on the port side of the bottom of the mast socket, located about one-third of the length of the vessel from the bow. The reverse of the coin had a representation of Fortuna, the goddess of luck, holding a ship's rudder, and was clearly deposited in the hope that it would bring good fortune to the ship. The timbers cross-match with other London chronologies, indicating that the vessel was local in origin (Tyers 1994, 204). The ship was decked, and the main hold was located in the middle of the ship, lined with a ceiling of heavy oak planks that at the time of the wreck supported a cargo of building stone. Traces of *Toredo* and *Limnoria* borings were found in the planks, indicating that the ship had certainly sailed at sea. It is probable that the last voyage of the vessel was from quarries near Maidstone on the River Medway, into the Thames estuary and then up the River Thames, using flood tides to reach London (*Figure* 3.4). The most likely cause of sinking was a collision with another vessel (Marsden 1994, 33-95). It has been calculated that the vessel could have carried a cargo of about 50 tonnes, that the estimated 26 tonnes of ragstone found in the ship would have only partly filled the hold, and that there was capacity for a further 24 tonnes of cargo.

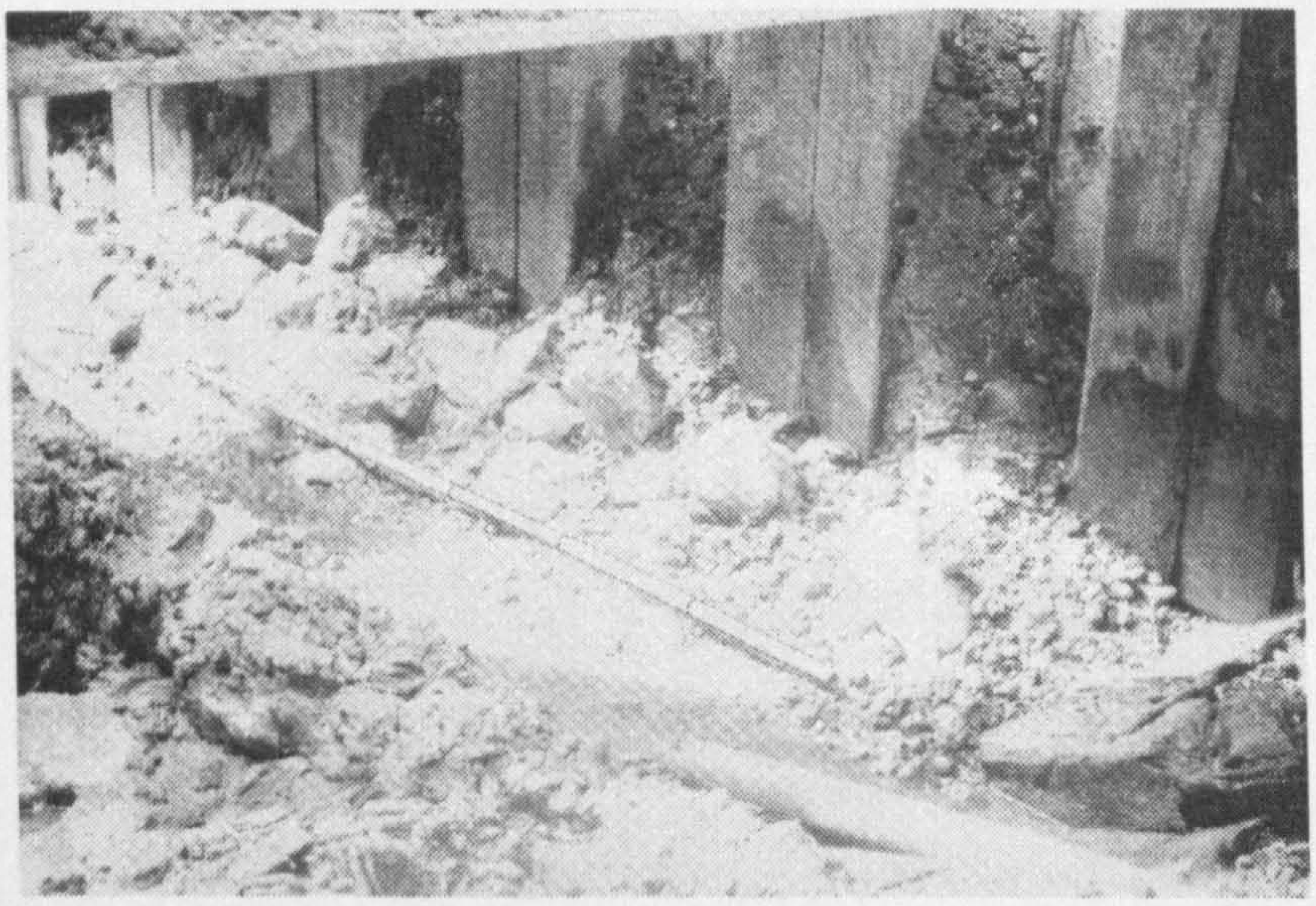


Figure 3.2. Part of the final cargo of Kentish ragstone of Blackfriars ship 1 (Museum of London)

Different types of cargo take up varying volumes (see Chapter 8) and other possible cargoes could have been 12 large barrels of wine, each weighing 1.278 tonnes, or 18.36 tonnes of grain. Clearly, high-density cargoes such as ragstone place a considerable strain on the hull and explain why such heavy floor timbers and thick keel planks were used. It is even possible that, because of the huge quantities of stone required for building the walls of London, the vessel was specifically designed to carry materials for this task.

During the late 1st /early 2nd century ragstone was used extensively in public buildings such as the *basilica* and *forum* (Marsden 1987), public baths (Marsden 1976b), the amphitheatre (Frere 1988, 462) and the large fort (Grimes 1968, 15-40). However, the greatest single demand for stone was for the defensive city wall, constructed in the early 3rd century, requiring a massive amount of stone. Marsden (1980, 126-7) has estimated that a volume of 35,000 cubic metres was used in the construction of the wall. The carrying capacity of the Blackfriars ship has been estimated at about 20 cubic metres of stone weighing 26 tonnes, and it would have required 1,750 voyages, by ships of this size, to bring about 45,000 tonnes of stone from the source, some 112 km away. The most likely location for the quarry supplying the stone is at Allington, 1.5 km north of Maidstone, where ragstone outcrops on the west bank of the Medway. It is probable that vessels could reach there on flood tides, and it may be significant that traces of Roman buildings have been found there. It is possible that the quarry formed part of an Imperial estate and that the control of the production, labour force, and means of transportation were in the hands of the *procurator*. However, whether the vessel was part of the *Classis Britannica*, and was acting as some form of fleet auxiliary (Milne 1996, 234-8), or whether it was in private ownership and under contract for the voyage cannot be known.

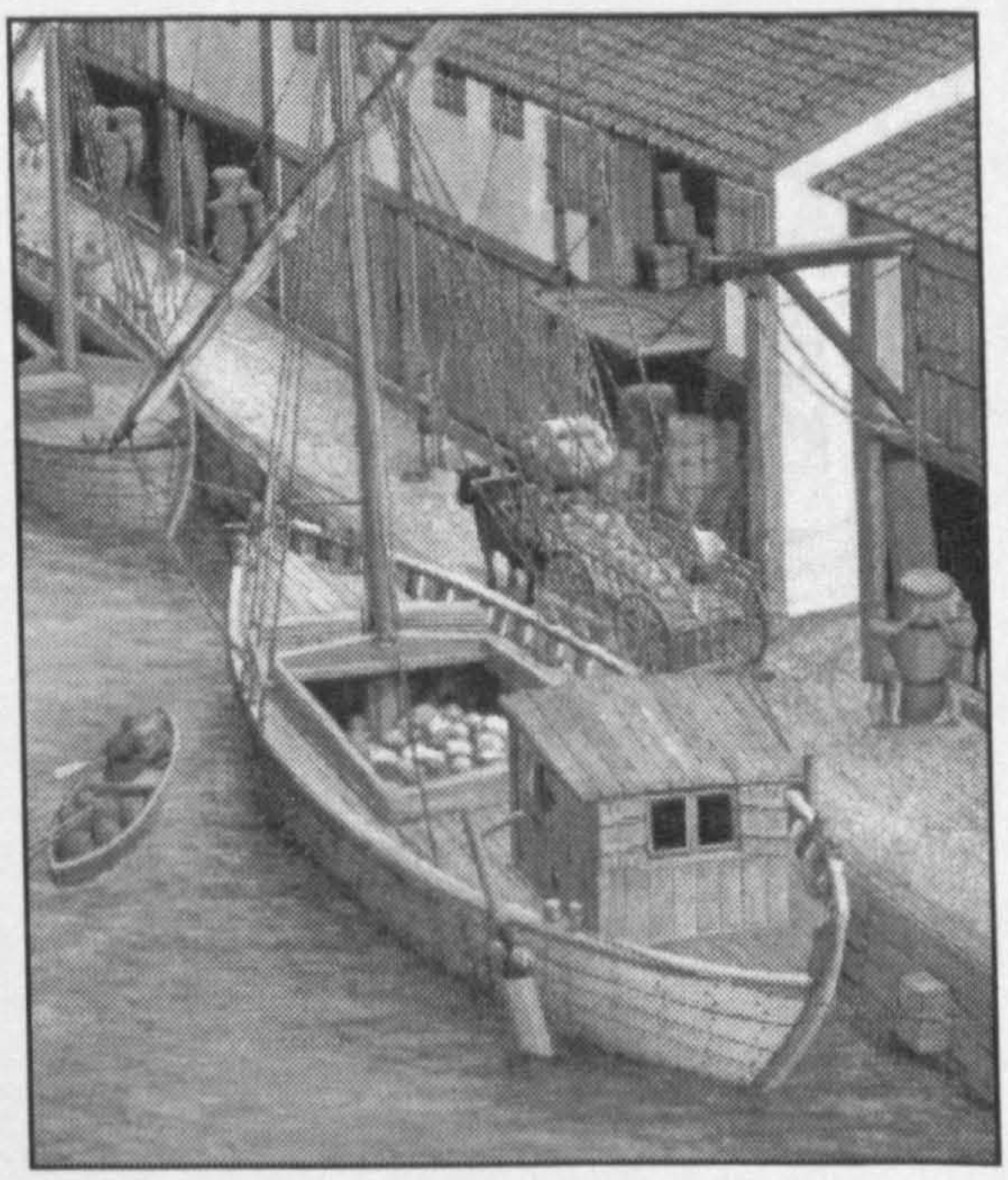


Figure 3.3. Unloading Kentish ragstone (Museum of London)

From a hypothetical reconstruction of the vessel a mast height of 12.7 m has been calculated and, since the deck of the Roman bridge is estimated to have been circa 5-6 m above the river level at low tide (Milne 1985, 44-5), the Blackfriars ship could not have passed beneath with its mast still standing. Either a drawbridge opening in the bridge permitted the passage of vessels with fixed masts, or the mast must have been lowered. Marsden (1994, 70) considers that with a crew of probably three, the combined weight of the mast, yard, and sail, (some 3 tonnes), would have been beyond the capabilities of the crew whilst under weigh. He accepts the possibility of the mast being lowered downstream of the bridge and the vessel being towed upstream, but suggests the use of a drawbridge to be the most likely option. He also points out the value of the mast for the swaying in and out of heavy items of cargo. The mast was stepped about one-third of the length of the vessel from its bow and, whilst Roman iconography makes it clear that the "square" sail was most commonly used on the larger ships throughout the Mediterranean region, McGrail (1987, 225-7, 234) has drawn attention to the steering problems of sailing to windward, using a square sail stepped so far forward. A sprit-sail or a lug-sail is a possibility, although there is no archaeological or pictorial evidence to support either of these types in the Northern provinces at this time. However, Marsden considers the square sail to be the most likely option, and submits that, by waiting for a following wind, the master would have minimised the steering problems, and points out that, in recent centuries, this practice was normal for sailing ships in northern European ports. It is probable that the ship was steered by two quarter rudders, similar to those shown in Figure 3.3. The St Peter Port boat offers significant evidence for a deck house as living quarters for the crew, but no such evidence is available for the Blackfriars boat and the depiction of a deck house, as seen on a number of illustrations, is purely conjectural. As the vessel was clearly involved in making passages lasting several days, some form of living accommodation must have been provided, but this could have been in the after hold.

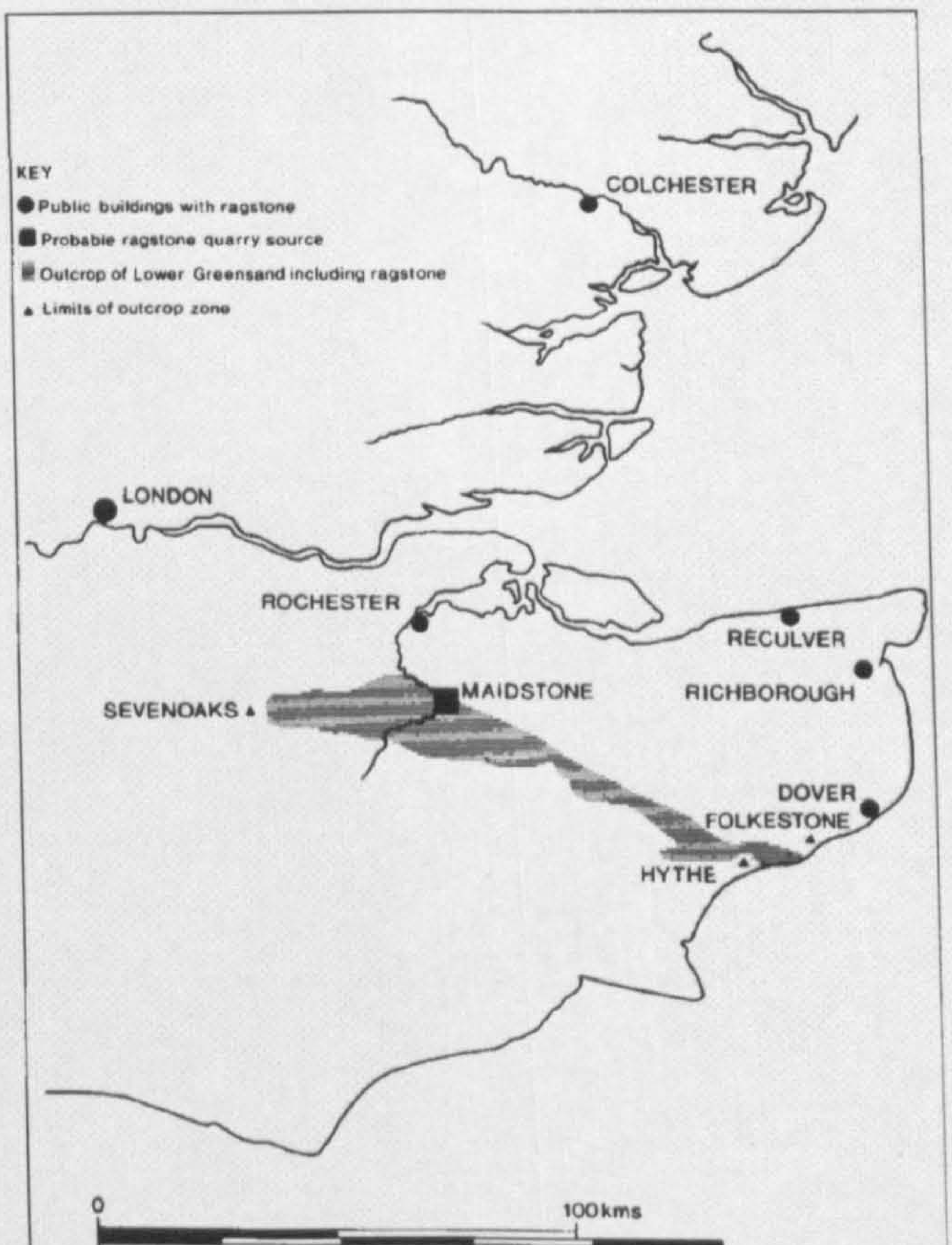


Figure 3.4. Last voyage of Blackfriars ship 1 is shown by source of the ragstone cargo, from near Maidstone, Kent (Museum of London)

<u>St Peter Port Ship</u>

A Romano-Celtic merchant vessel, carrying a part cargo of pine resin, caught fire and sank in shallow water off St Peter Port on the east coast of Guernsey. During the fire, the pine resin melted, setting into a solid mass as the vessel sank, and holding the timbers together until the ship was discovered in 1982. Excavation took place from 1984 to 1986 and revealed that the ship is the largest, most intact sea-going vessel of the Roman period found outside the Mediterranean (Rule & Monaghan 1993). St Peter Port provides a natural anchorage, as it is sheltered from the prevailing westerly winds and flanked by rocky reefs. The present harbour bears little resemblance to the shoreline during the Roman period, as the natural reefs have been gradually absorbed into man-made breakwaters, as the harbour has been extended seawards.

The ship was some 25 m in length, with a maximum beam of 6 m, and a height to the gunwale of at least 3 m and, although the bow structure had disintegrated, the excavators suggest that the ship was double ended. The vessel was constructed entirely of oak, with caulked planks laid edge-to-edge, in a similar manner to the Blackfriars ship. A single sail was carried on a mast, stepped in a large floor timber, and situated approximately one-third of the ship's length from the bow. The mast would have been at least 13 m tall and could have carried either a square sail or a fore-and-aft sail. There was evidence of deck planking at the stern, and an internal partition suggests that the ship had an after hold, and although there is no proof for the existence of a forward hold, it is likely that one existed. Artefactual evidence of personal belongings suggests a crew of 3, and that a galley area was positioned over the after hold, possibly in a deckhouse (Rule & Monaghan 1993, 13-70).

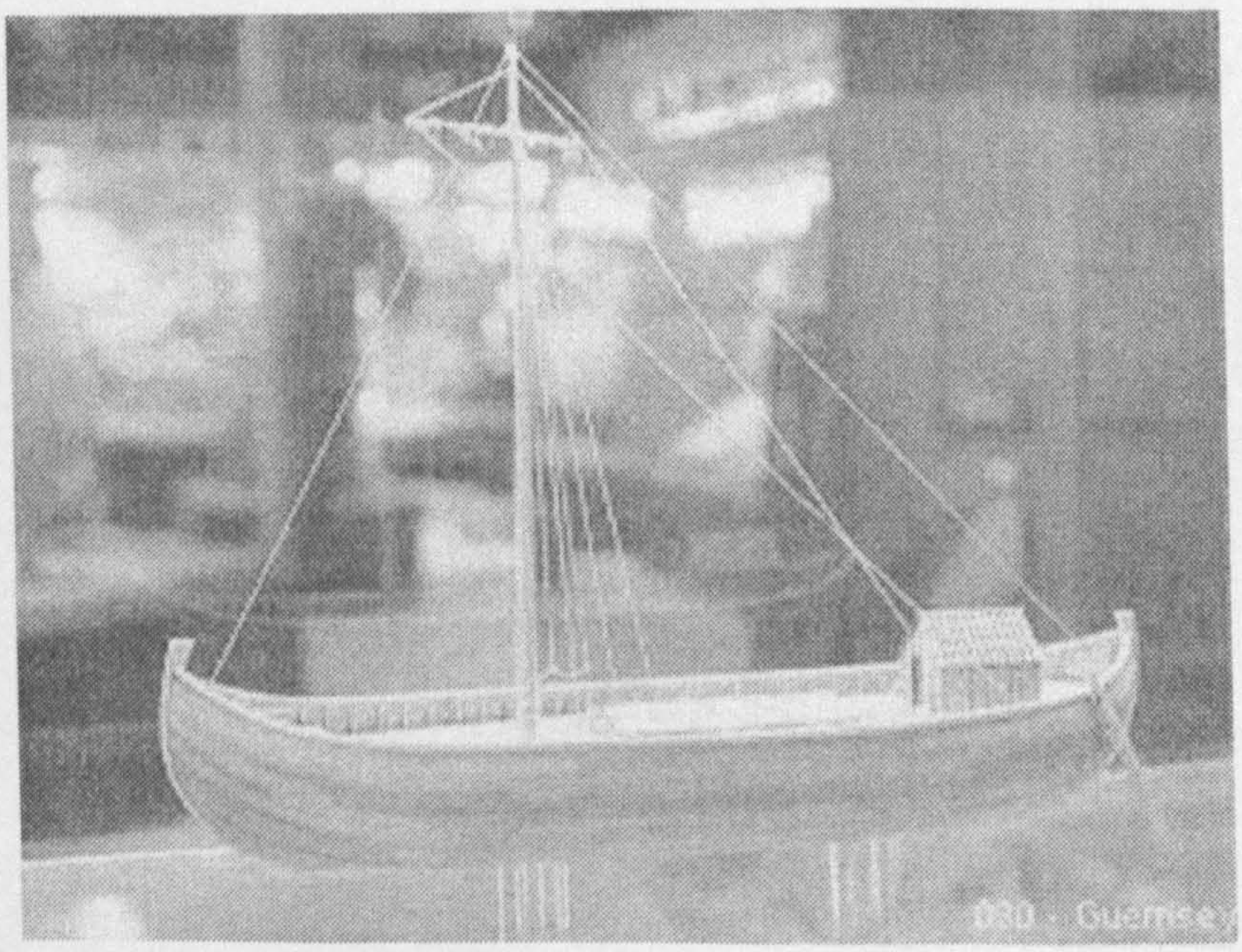


Figure 3.5. Reconstruction of the Gallo-Roman trading vessel wrecked at St Peter Port, Guernsey (Guernsey Museum)

Eighty Roman coins were recovered, and fall into two chronological groups, the first comprising six regular *aes* issues of the 2nd century, dating from the reign of Hadrian onwards, with the second group of seventy-four coins all being *antoniniani* of the late-3rd century. The coins are of low intrinsic value and representative of the range in everyday use at the time of shipwreck. It may reasonably be concluded that the money was not used for the purposes of trade and belonged to members of the ship's crew, indicating a probable date for the sinking of the ship between the early AD 280's and 287 (*ibid.* 71-74). No evidence for an anchor, or anchor stone, was found in the vicinity of the wreck and it is probable that, at the time of the fire, the ship was anchored (or beached), and drifted away from its original position. No evidence for ballast was recovered, and there was no indication of its use on previous voyages. However, it is probable that the weight of the bulky floor timbers lowered the centre of gravity sufficiently for the ship have an acceptable degree of stability, particularly as it is likely that the vessel would have seldom sailed any distance without some kind of cargo in the hold. The flat bottom of the ship gave the advantage of being able to take the ground in a region of high tidal ranges and few developed harbours. This ability and the relatively shallow draft would have enabled it to enter the estuaries and rivers on which most contemporary ports were situated, thus reducing the need for cross-decking of cargoes. The underside of the keel showed a small amount of damage that may be attributed to abrasion when, in the absence of port facilities, the ship was deliberately beached to load or unload cargo (*ibid.*, 15).

In common with the Blackfriars ship, the vessel bears a striking similarity to the description of the Venetic ships given by Caesar in his description of the sea battle off Britanny in 56 BC (*BGall.* 3.13), and was clearly part of a shipbuilding tradition shared by many Celtic tribes of the Atlantic seaboard. Iconographic evidence is provided by a first century Celtic coin from Canterbury, and another found at Sheepen, Colchester, both depicting a high-sided ship with very bluff bows and stern, and possibly flat bottomed. The coins show a single mast with fore-and-aft stays and a square sail set on a single yard.

Quantities of plant remains, consisting mainly of cereals, were recovered from the St Peter Port wreck, preserved either anaerobically or by charring, and it is probable that this material represents food stores for the crew of the vessel, probably stored within well-sealed amphoras. The after hold contained fragmentary remains of oak barrels or casks, all of which were charred to a greater or lesser extent. If these contained cargo, for example wine, a northern European origin is indicated, as products of the Mediterranean provinces tended to be transported in amphoras. Two Dressel 30 amphoras, thought to originate in Algeria in the 3rd/early 4th century, probably carried olive oil, although the excavators point out the possibility that they were being re-used for general liquid supplies, such as fresh water (Rule & Monaghan 1993, 82). Tyers has drawn attention to the wide ranging sources of supply in the small pottery assemblage recovered from the wreck (1996, 73-4), and the implications of this are discussed in more detail in chapter 9. A large quantity of pitch blocks had been stored in the rear hold of the ship, but during the fire the pitch melted and spread across and between the floor chambers. The pitch was being transported in rectangular blocks before it melted, and the underside of each block was coated with sand to a depth of 3-4 cm. It is probable that during production hot pitch was poured into square wooden frames placed in a sandy area, and that solidification of the pitch took place *in situ*, resulting in the incorporation of the sand into the base of the blocks. Study of the quartz grain surface textures by scanning electron microscope has established that the sand is not native to the Channel Islands, where the sand is generally angular with high proportions of feldspars, mica, and some clay materials. The sand from the pitch blocks was dominated by well rounded quartz grains, indicating an origin in a flat high-energy coastal environment and it is suggested that the most likely provenance for the sand, and therefore the pitch blocks, is on the coastal dune fields of Western France (Rule & Monaghan 1993, 105-7). The remains of marine organisms present on board the ship before it sank are characteristic of the Atlantic coasts of France, Spain, the English Channel west of Cherbourg and the southwest of Ireland. Interestingly, several of these species would not be found outside this area, for example, in the Channel east of the Isle of Wight, Wales, Northern Ireland or the Mediterranean (*ibid.* 113-121). Whilst the evidence indicates that material of southern European origin had at some stage being taken aboard, it cannot itself indicate that the vessel or its cargo had originated in the Mediterranean world and the excavators speculate that it operated primarily in the Channel, with perhaps occasional voyages as far south as Atlantic Spain or as far east as the North Sea, operating as a "caboteur", *i.e.* a coaster moving cargoes of opportunity from point to point (*ibid.* 130).

<u>*Hide-covered boats*</u>

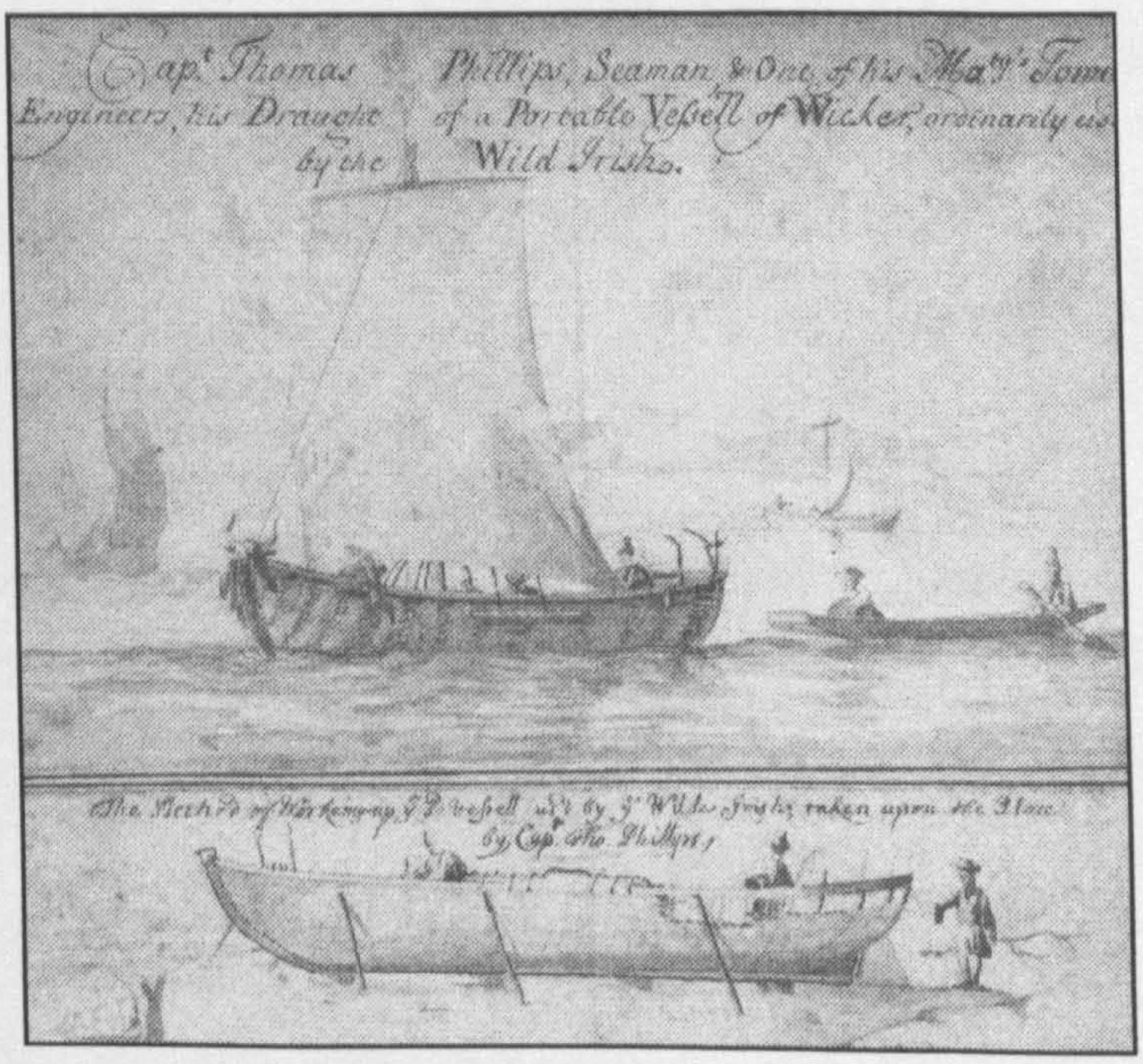


Figure 3.6. Seventeenth century drawing of a large sailing curragh. (Magdelene College, Cambridge)

When faced with a difficult river crossing of the Segre at Lérida in Spain, Caesar ordered the construction of "ships of the kind his experience in Britain in previous years had taught him to make. The keel and the first ribs were made of light timber; the rest of the hull was wattle and covered with hides." (*BCiv.* 1.54). The similarity to the type of craft now called a curragh is clear and, as Caesar had only visited the south-east of England, it is obvious that the use of this type of vessel was much more extensive than it is today, when it is restricted to the west coast of Ireland. That this has been the case for some considerable time is indicated by a drawing made in 1685 (*Figure* 3.6), by Captain Thomas Phillips of the Royal Navy of a curragh; bearing a caption including the words "ordinarily used by the Wild Irish"

The 6th century AD *Massaliote periplus* quoted by Avienus (*Ora Maritima*), is the earliest known reference to skin boats operating in the Atlantic, and later this type of craft is also mentioned by Pliny the Elder (HN 4, 104) when describing the transportation of British tin on a six day voyage (probably from Cornwall) to the Isle of Wight (*Vectis*). Lucan (4. 136-8) described skin boats that "on the expanded ocean the Briton sail" and Pliny (*ibid.* 7, 205-6) writes of boats with prominent keels, constructed by stretching hides over an osier or woven wicker-work skeleton. In his 3rd century *Polyhistor* (*Collectanea Rerum Memorabilium*), Solinus describes voyages from Britain to Hibernia in "small boats formed from pliant twigs, covered with skins of oxen". Written in the late 7th century, Adamnan's *Life of Saint Columba* mentioned the construction of a curragh, describing it as a large craft with a sail set amidships and capable of carrying a crew of 17, together with sufficient provisions for 14 days (Marcus 1953-4, 315). The suitability of this type of vessel for ocean passages was demonstrated by the crossing of the Atlantic in 1976 by Tim Severin (1983) in the "*Brendan*", even though the vessel may not have been an authentic replica (for example, the addition of a fore-sail) of an early sea-going boat.

McGrail (1990, 39) points out that hide boats are quickly built, are inexpensive compared to a similar sized plank boat, and are readily repaired. They are excellent surf boats and can be operated from almost any shore without the need for formal landing places. He also suggests that they are more seaworthy and sea-kindly than equivalent plank boats, as their lightweight structure is buoyant and gives good freeboard, even when loaded.

It is clear that any evidence for a craft of this construction is unlikely to survive in the archaeological record. In 1896 a small gold model (*Figure* 3.7), dating to the 1st century BC, was found in a field at Broighter in Co Derry, Ireland. The vessel carried a mast with a single yard and a steering oar positioned to the rear quarter, and may well represent an early version of the curragh. Equipped with 18 oars, indicating a crew of perhaps 12 men, equipment included 3 forked barge poles and a grappling pole or anchor. The proportions of the model, and the relative size of its fittings, suggest a vessel with a length of between 13 and 17 m. (Cunliffe 2001, 103-106).

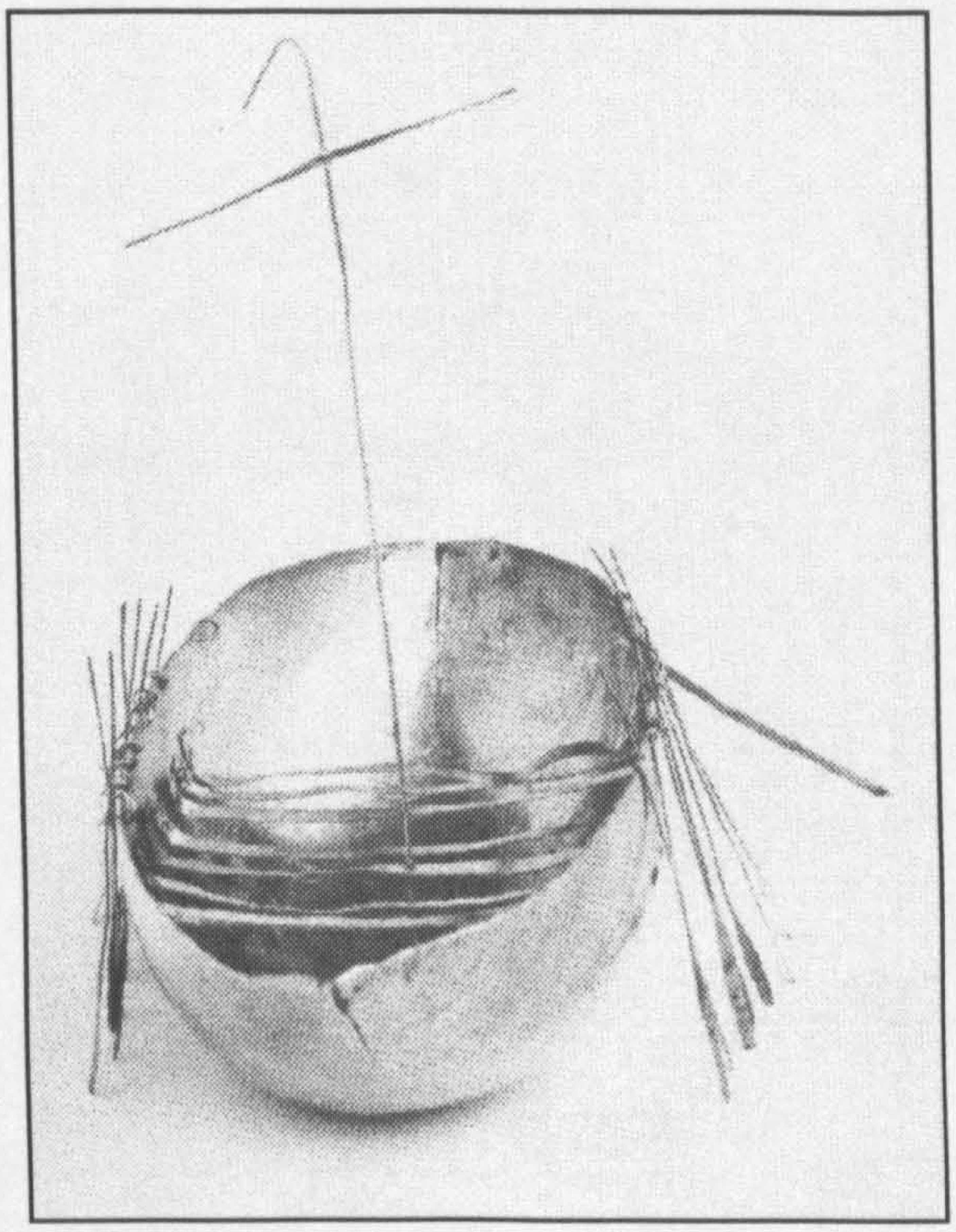


Figure 3.7. Gold model of 1st century BC boat from Broighter (National Museum of Ireland)

The peaceful missionary use of the curragh during the "Age of the Saints" has been mentioned above, but towards the end of the Imperial era, whole fleets were used in recurrent Irish raids against Roman Britain, in one of which, St Patrick is said to have been carried off (Marcus 1980, 8). In *De excidio et conquesto Britanniae,* written in the 6th century, Gildas tells of swarms of black curraghs, crammed with hirsute, half-naked warriors, bearing down on the British coastline, attracted by the prospect of abundant loot.

<u>Written, numismatic and epigraphic evidence</u>

<u>The ships of the Veneti</u>

This chapter has, so far, been concerned with the archaeological remains of ships and boats that have been found in the British Isles. There is, however, literary evidence from Julius Caesar, Cassius Dio and Strabo giving valuable information about the ships of the Veneti, a major tribe of seagoing merchants from the south coast of Brittany, whose sphere of influence stretched from Portugal to the shores of Britain, and possibly Ireland. Caesar describes them as the most powerful tribe on the coast, having the largest fleet of ships, in which they trafficked with Britain. After a long campaign, both by sea and land, Caesar eventually brought the Venetic fleet to battle of the Gulf of Moriban on the southern coast of Brittany in 56 BC and, after a long and hard battle, 220 of their ships were destroyed. It is interesting that Caesar comments that, before they battle, they "summoned reinforcements from Britain which faces that part of Gaul", and this may imply that Britain, and in particular Dumnonia, possessed similar ships to those of the Veneti (*BGall.* 3.12). Caesar states that "They (the

Veneti) constructed their hulls with somewhat flatter bottoms than our craft to make it easier to go through the shallow depths of low tide and over shoals; the prows and the sterns are rather high to handle the size of the waves when the sea is stormy; the ships are made throughout of oak to withstand any amount of violence and hard treatment. Beams are of timber a foot square made fast with iron nails an inch thick and anchors are held by iron chains instead of ropes. Their sails are of hide or softened leather instead of canvas, possibly because they have no flax or do not know how to use it, but more likely because they think canvas will not stand up to the storms of the ocean and the violence of the winds and will not drive such heavy ships efficiently" (*ibid.* 3.13). Strabo gives a similar description commenting that "because of the ebb tides, they make their ships with broad bottoms and high sterns, and high stems; they make them of oak (of which they have plentiful supply), and that is why they do not bring together the joints of the planks but leave gaps. These they caulk with seaweed, so the wood may not, for lack of moisture, dry out when the ships are hauled up, because the seaweed is naturally rather moist, whereas the oak is dry and without fat" (V. 4.1). Regrettably, despite the number of vessels lost, and with reasonable knowledge of the location of the battle, no remains have been excavated.

The ships of the Veneti were therefore solidly built, rode high in the water, and had flat bottoms enabling them to move close inshore and take the ground in tidal waters. They were more seaworthy, but not as fast as Roman galleys. They were probably caulked with moss, had square leather sails on a single yard, on a mast stepped midships, and iron anchor chains to obtain catenary effect when mooring. This combination is to be expected when sail driven Channel ships are compared with Caesar's oared warships which, even if built on the Loire, were to a Mediterranean specification. It will immediately be apparent that Blackfriars 1 and the St Port ship (above) bear a marked resemblance to Caesar's description.

Whilst admitting that the evidence is somewhat slender, Weatherhill (1985, 163-9) has suggested a reconstruction of a Venetic ship and this is shown below;

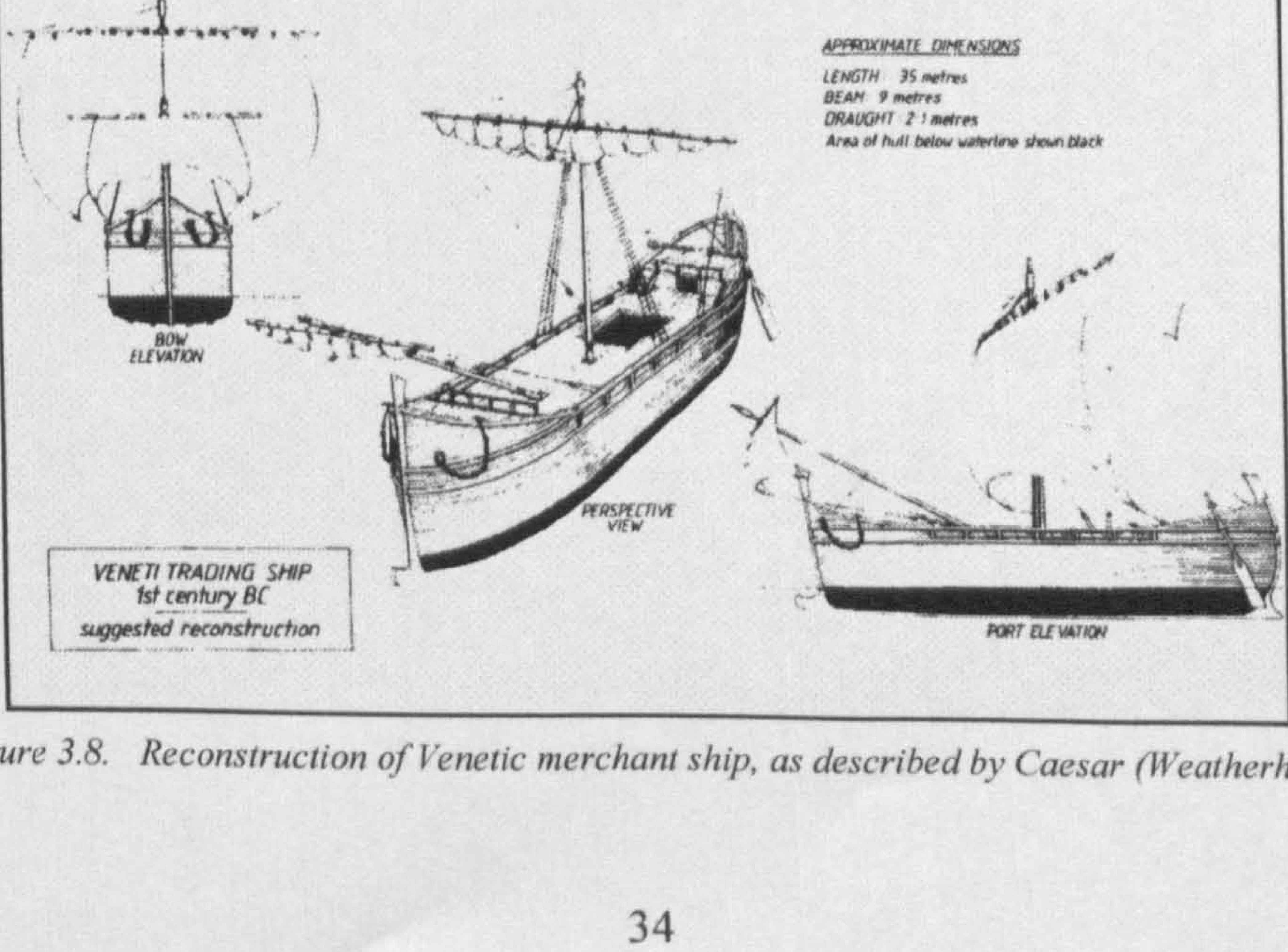
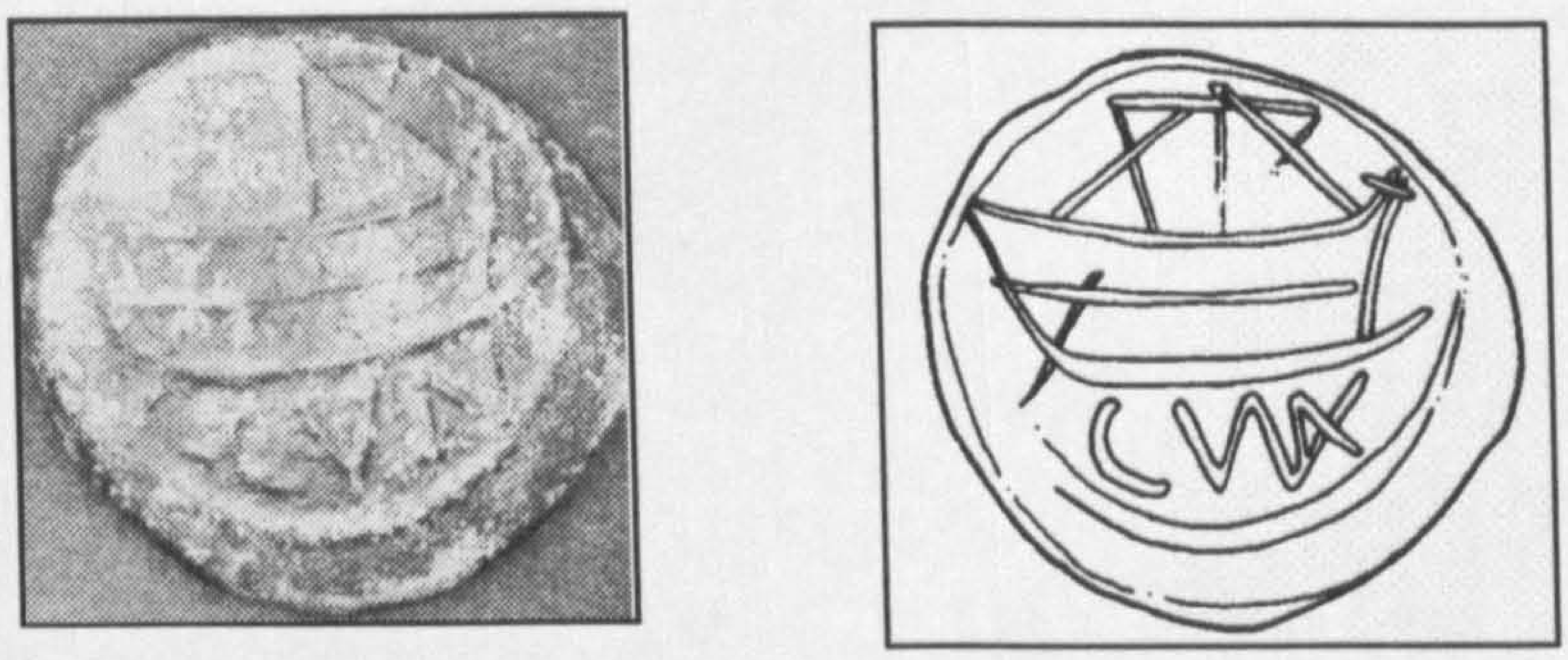


Figure 3.8. Reconstruction of Venetic merchant ship, as described by Caesar (Weatherhill)

Evidence from coins

Muckleroy *et al.* (1978, 439-44) drew attention to an early 1st century AD bronze coin of Cunobelin found at Canterbury (*Figure* 3.9). The obverse of this coin shows the starboard side of a bulky, high sided ship with a single mast and yard, with prominent stays and a steering oar. The stem-post is straight, raking at an angle of 10 degrees from the vertical, the gunwhale angles sharply upwards towards the bow and the stern-post is curved. The ship is clearly not a warship but is a merchantman, like the Venetic ships it so closely resembles. McGrail suggests that the depiction of ships on his coinage, probably reflects overseas trading voyages by his ships, from the Catuvelaunian tribal area situated to the north of the River Thames (2001, 196; 205-5).



Figures 3.9. Left - Obverse of bronze coin of Cunobelin, and Right – Interpretation of depiction (Institute of Archaeology, Oxford)

Craft of the estuaries and rivers

Barland's Farm Boat

A late 3rd century Romano-British boat was found at Barland's Farm, near Magor, Gwent, South Wales; some 3 km from the present foreshore of the Severn Estuary, and 6 km to the east of the River Usk. When excavated, the vessel, constructed entirely of oak, lay with a list to port, with a maximum of 5 planks surviving on the port side and only three on the starboard side.

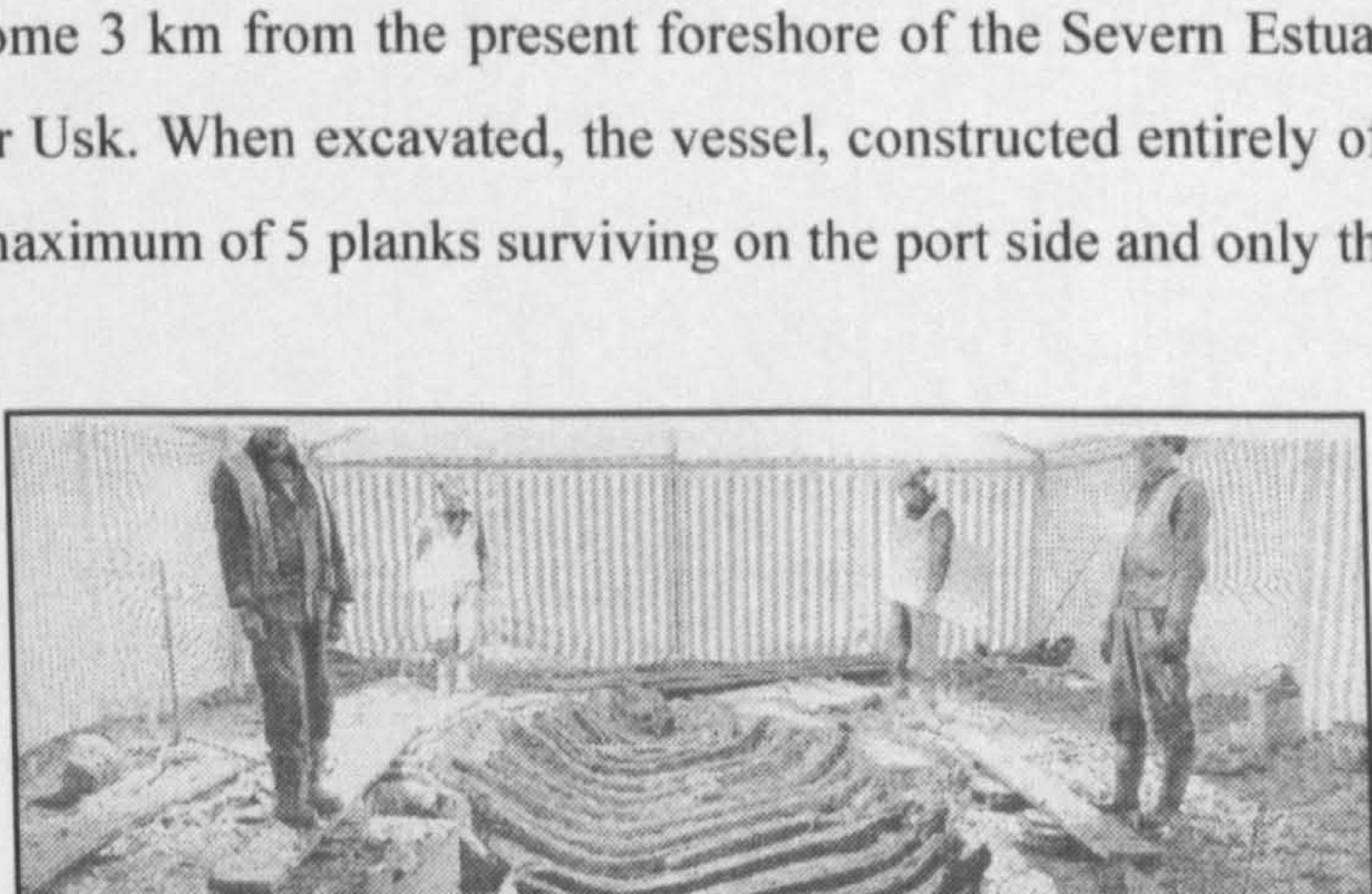


Figure 3.10. The Barland's Farm boat, after initial cleaning (Gwent-Glamorgan Archaeological Trust)

The boat lay with its stern resting on the remains of a 3rd century stone and timber structure, near to a stream which, in the Roman period, had flowed south into the estuary, This consisted of a 5 m stone wall of rough slabs of sandstone, revetted by two squared oak uprights, with two partially surviving horizontal oak timbers between them. It has been interpreted as a jetty/landing stage or timber bridge. The stern of the boat was incomplete, suggesting that it had been dumped in a derelict state, possibly to stabilise the stream edge in the vicinity of the bridge/jetty (Nayling, Maynard & McGrail 1994, 599). A 1:10 scale model of the boat was made "as found", but with displaced, fragmented and distorted timbers reinstated (*Figure* 3.11) and was used as a basis for a theoretical reconstruction of the whole of the vessel. As reconstructed, the boat would have had overall dimensions of 11.40 m by 3.16 m by 0.90 m, with the bow and stern being generally similar, but not of exactly the same shape. The boat displays many of the characteristic features of the Romano-Celtic boat building tradition, with sawn planks laid edge-to-edge and not fastened together, the vessel made watertight by caulking made of plant material mixed with tar or resin. There is massive and relatively closely spaced framing, the planks fastened to the frames by hooked iron nails, and the mast stepped one-third of the water-line length from the bow. Although smaller, the Barland's Farm boat is therefore structurally similar to the mid 2nd century Blackfriars 1 ship from the River Thames, and the late 3rd century St Peter Port ship from Guernsey. It also has features in common with the Rhineland barges and river craft of this period.

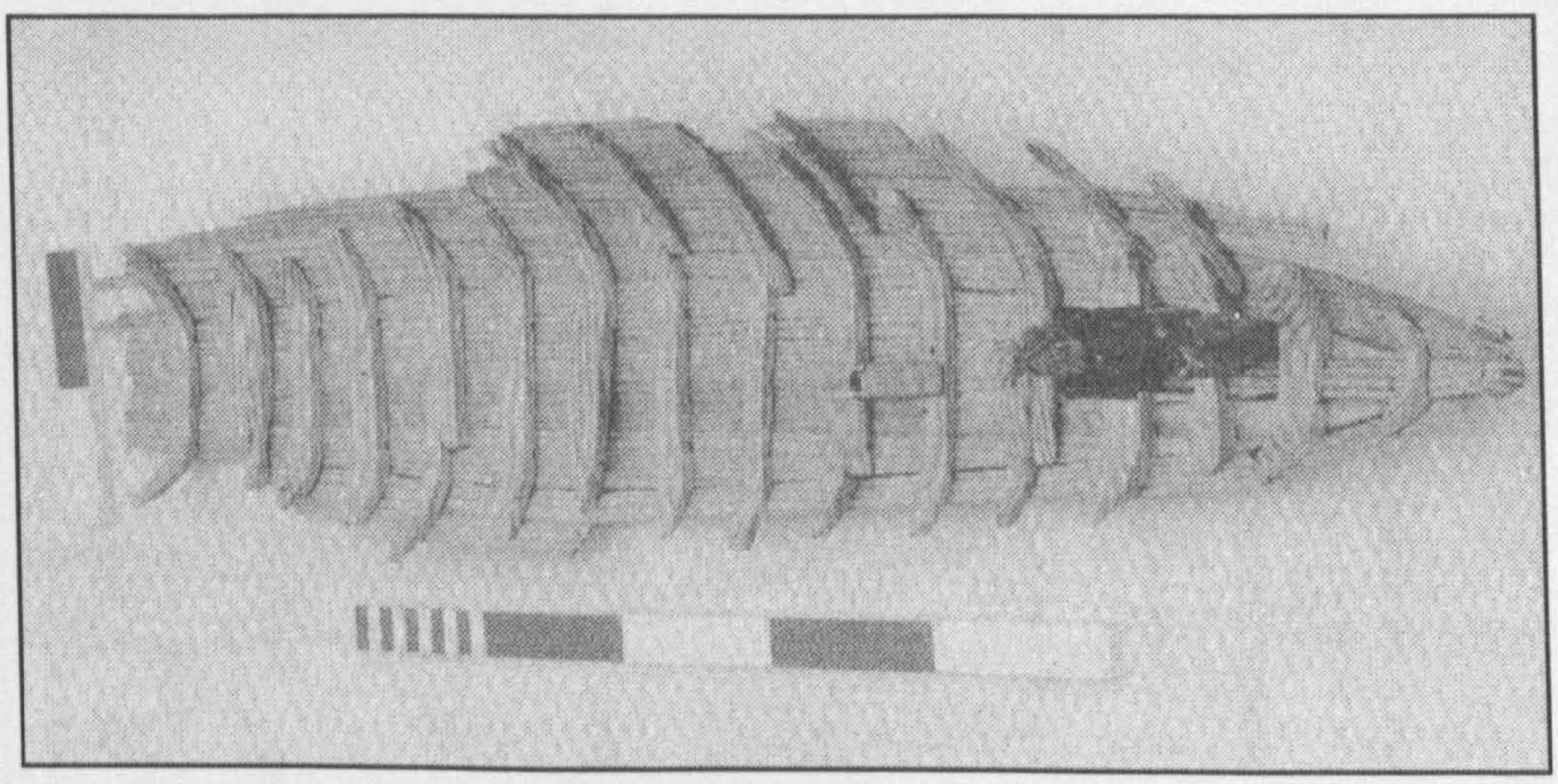


Figure 3.11. A 1:10 scale model of the boat "as found", but with displaced, fragmented and distorted timbers replaced (Tim Edgar)

The mast-step was located approximately one-third of the waterline length from the bow, in a position similar to those of the Blackfriars and St Peter Port ships (McGrail & Roberts 1999, 133-8). A mast stepped in a forward position suggests that either a sprit or lugsail would give a better performance than a square sail, and although the majority of evidence for such sails is from a much later date (Moore 1925), it has been suggested that vessels depicted on a 2nd /3rd century Rhineland mosaic, and on a gravestone, have leather lugsails fitted with battens (Ellmers 1978, 1-14, fig. 3) and the excavators consider a lugsail, fixed or dipping, as the most likely option. When loaded with 2.5-6.5 tonnes of cargo, giving a range of draughts from 0.34-0.52 m, it is considered that the boat could have been sailed in the Severn Estuary and Bristol Channel in winds of Force 4 on the Beaufort Scale (a moderate breeze of *c.* 15 knots, with wave heights of 1-2 m). When sailing on a broad reach with the wind on the beam, or possibly a little forward of it, the boat could have made 4-5 knots under sail. McGrail and Roberts suggest that, in open waters, 3.5 m oars used by each of two oarsmen sitting on the crossbeams, and pivoted through a rope grommet, could propel the boat at a steady 3 knots in light winds and that, when laden, the speed would have been reduced to about 1 ½ to 2 knots. Standing up to scull with an oar pivoted at the stern would be another option, but this would only be possible in very calm waters. In very confined waters, such as the stream where the remains of the boat were found, a pole of 3-4 m in length would be suitable for propelling the boat (1999, 141-145).

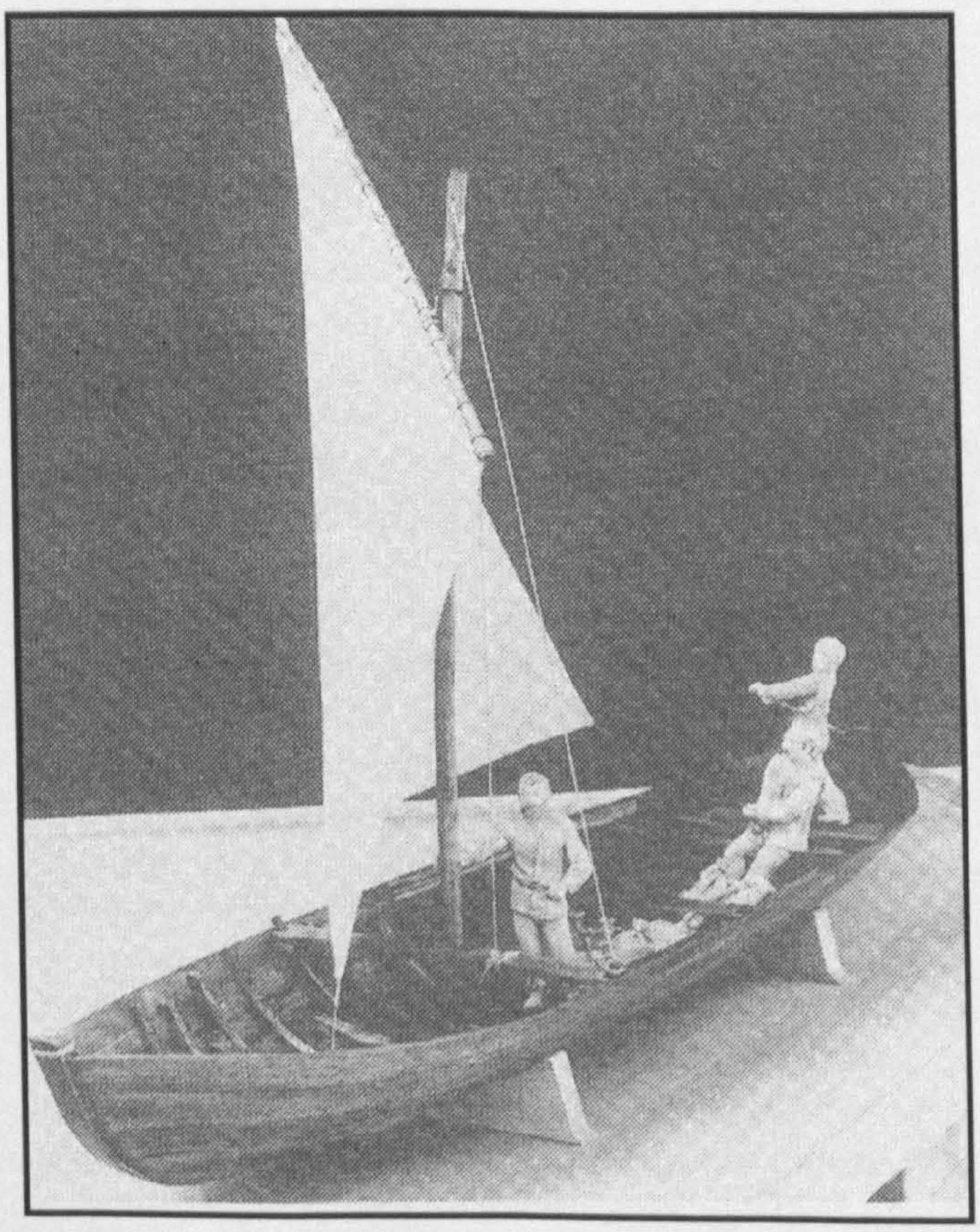


Figure 3.12. A 1:10 scale model of the Barland's Farm boat as reconstructed. (Newport Museum)

When operated under sail by a crew of 3, and with a draft of 0.34 m, the boat could have carried 15 medium-sized barrels of wine; or 90 sacks of grain; or 4.5 tonnes of salt/coal in sacks; or the same weight of iron, slate or stone laid on dunnage in the bottom of the boat. Livestock could have been carried provided they were temporarily penned by hurdles or with their legs trussed, and possible loads could be up to 50 sheep or 8 cattle. The sea-keeping capabilities of the Barland's Farm boat would have enabled it to make passages throughout the length and breadth of the Bristol Channel and the Severn Estuary, and in particularly favourable conditions a voyage to Ireland would have been possible. With her shallow draft the vessel could have operated in the majority of the local rivers, certainly within the tidal reaches and in many cases of progressing well inland. The Barland's Farm boat would therefore have been capable of transporting cargoes of up to 6.5 tonnes, to and from the majority of Roman forts and settlements in the area. (*ibid.* 1999, 133-46).

<u>New County Hall Ship</u>

During the building of London County Hall in 1910, on the south bank of the River Thames, opposite Westminster, the wreck of a late 3rd/early 4th century vessel was found, and the remains recovered and transported to the London Museum.

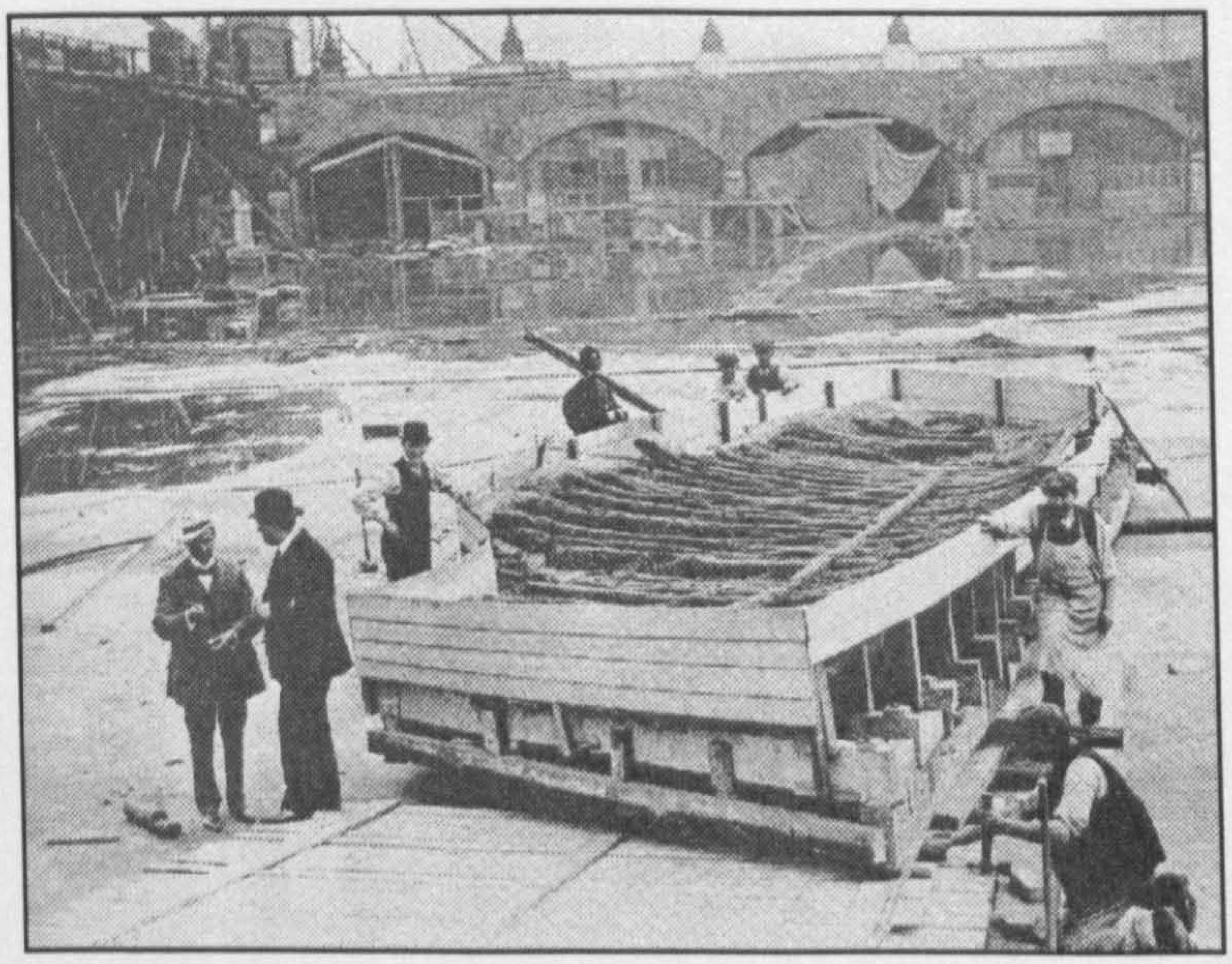


Figure 3.13. Loading the wreck for transport to the London Museum. (Museum of London)

Unfortunately, at that time the techniques of preservation of wooden timbers were effectively non-existent, and together with several attempts at restoration, this meant that there had been serious deterioration by the time it was decided to dismantle the remains of the exhibition, and place them in storage. Peter Marsden, who was given this task, found that very little of the hull had survived. He commented that "most of what was on exhibition in the basement of Lancaster House comprised a variety of plasters mixed with wire, rags, small fragments of ancient planking, and even bone, all of which had been coated with tar or painted black on the inboard faces to simulate the ancient wood. Indeed, apart from the frame, very little else of the ship had survived in any meaningful form, and there was no guarantee that any of the timbers, apart from the hull, were in their correct positions" (Marsden 1994, 109). However, a full-size copy of the original large-scale plan of the vessel as excavated existed (although limited by today's standards), and the construction of an accurate scale model for exhibition in the new "Museum of London" helped to clarify details of the vessel's construction.

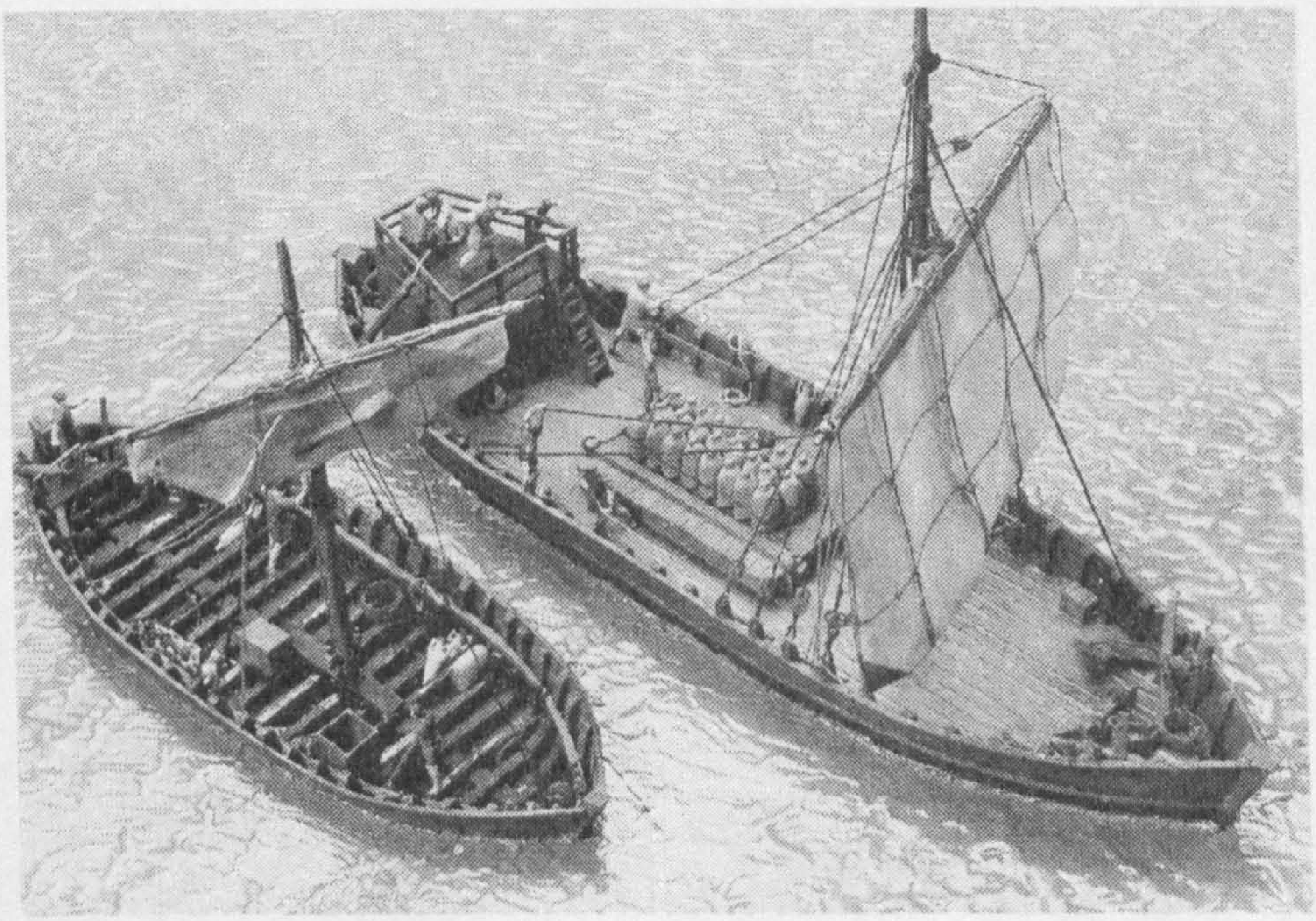


Figure 3.14. Unloading from sea-going vessel to shallow draught barge (Museum of London)

The theoretical reconstruction of the vessel suggests a length of 19 m, a beam of 5 m and a height to the top of the gunwale of some 2 m. The ship was built with its planks fastened edge-to-edge by mortice-and-tenon joints without any caulking, a characteristic of shipbuilding in the Mediterranean region; the frames were fastened to the strakes by oak trenails. This is in marked contrast to the Romano-Celtic method then in general use in the Northern provinces, and typified by the St Peter Port and Blackfriars 1 ships. Although there is no remaining evidence, the fact that the ship was of Mediterranean-style construction suggests that its propulsion was by a single square sail and that it was steered by two quarter rudders. In ancient wrecks, only the lowest parts of vessel survive, usually because they are buried under the cargo, but a deposit of alluvium over the collapsed side of the County Hall ship preserved some evidence of decking. Although the vessel is characteristic of shipbuilding in the Mediterranean area in classical times, a dendrochronological study shows a tree-ring pattern typical of southeast England, with a probable felling date after AD 287, and it is clear that it was built from trees growing in the region. However, the shipwright had probably been trained in the Mediterranean, as he was clearly experienced with the ship-building techniques of that area. Bronze coins found in the ship included a coin of Tetricus the Elder (Emperor in Gaul) AD 270-3, two coins of Carausius (Emperor in Britain) AD 287-93 and a coin of Allectus (Emperor in Britain) AD 293-96.

The decline during the 4th century in the importance of *Londinium* as a port, is evidenced by the fact that the 2nd and 3rd century quays found there were decaying, and had been separated from the rest of the city by a riverside defensive wall (Brigham 1990a, 140-1) and that at other locations silted deposits had accumulated at the front of quays. As goods were still being imported into the city, some limited facilities for berthing and lading must have existed, but they have not, as yet, been located. It therefore seems possible that seagoing ships were moored in the river and unloaded their cargoes into shallow draft barges and Marsden (1994, 108) suggests that the County Hall ship might have been used in this way.

However, it does seem somewhat surprising that a vessel of sophisticated Mediterranean-type construction should have been built, firstly at this time, and secondly for such a comparatively low level task, and seems probable that this might have been a secondary use of the vessel. The most dramatic suggestion for the role of the vessel comes from Riley and Gomme (1912, 17-22) who consider that it was a warship and that it was sunk during the battles for the recovery of Britain in AD 296. In support of this, they point out that a rounded stone, weighing about 1.5 kg, was found partly embedded in a strake, as if it had been thrown from a considerable height. However, Marsden draws attention to the fragile nature of buried waterlogged wood, and suggests that an embedded stone need not have been projectile, for the pressure of overlying sediments could well have pressed it into the waterlogged planking, long after the burial of the ship (1994, 128). Although it is purely speculative, it is tempting to associate the vessel with the rebellion of the usurpers Carausius and Allectus that was ended in AD 296, by the reclamation of Britain by the legitimate Roman rule of the west, Constantius Chlorus. The reverse of a golden medallion, found at Arras in northwest France commemorates the arrival of the Emperor in London (*Figure* 3.15), and although Chlorus is shown on horseback, an oared vessel is also shown. Whilst this is a much more elaborate craft than the County Hall ship, it is possible that, even if not serving as personal transport for the Emperor, the vessel might have been used in some form of accompanying procession, demonstrating the return of Imperial rule.

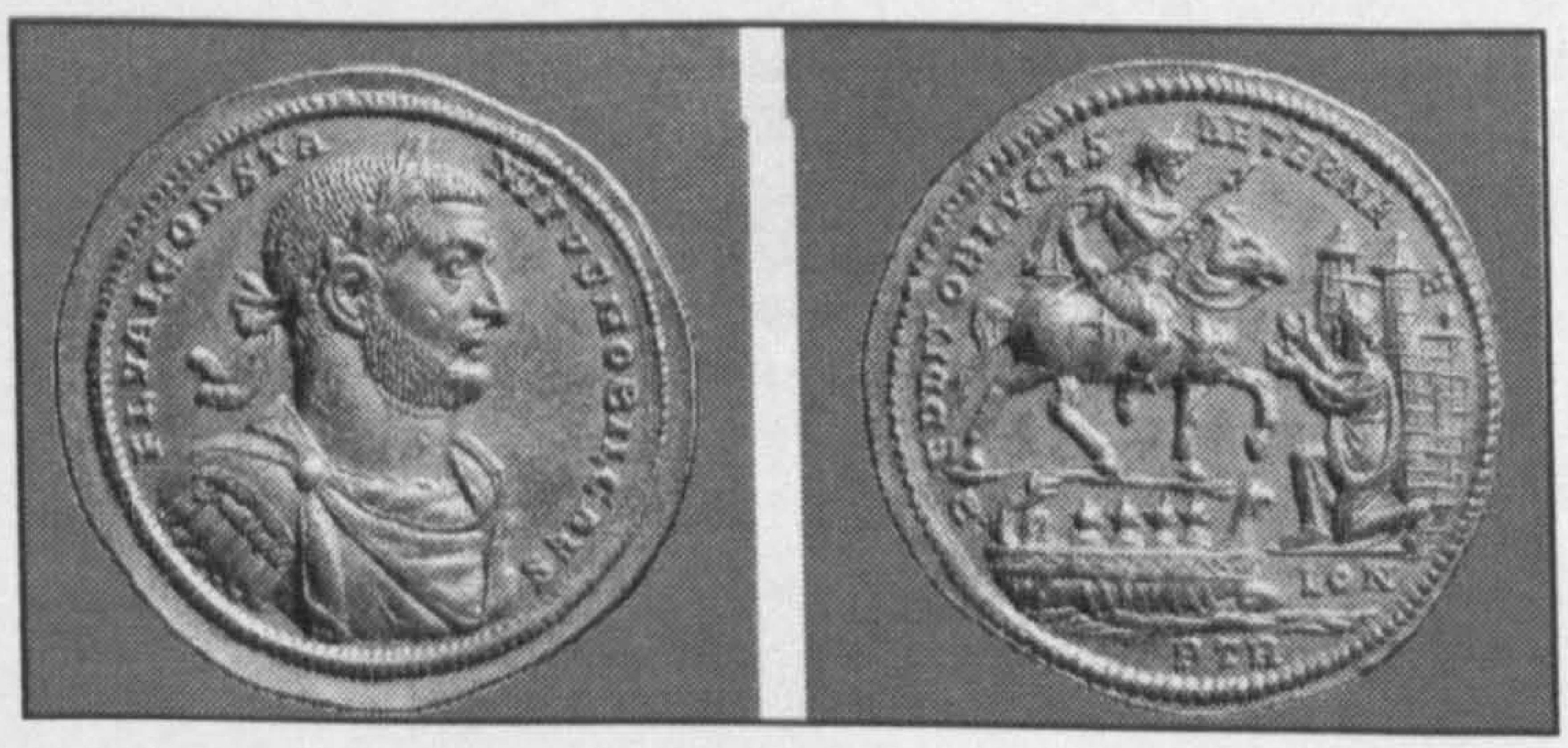


Figure 3.15. Gold medallion depicting the guardian spirit of Londinium kneeling to welcome Constantius I as "restorer of eternal light" (reditor lucis aeternae). (British Museum)

New Guy's House boat

This 2nd century boat, belonging to the Romano-Celtic shipbuilding tradition, was found in a silted creek, close to the south end of London Bridge (*Figure* 3.16), during the laying of foundations for extensions to Guy's Hospital in 1958. Only one end of the boat was excavated and it has not been possible to determine whether this was the bow or the stern.

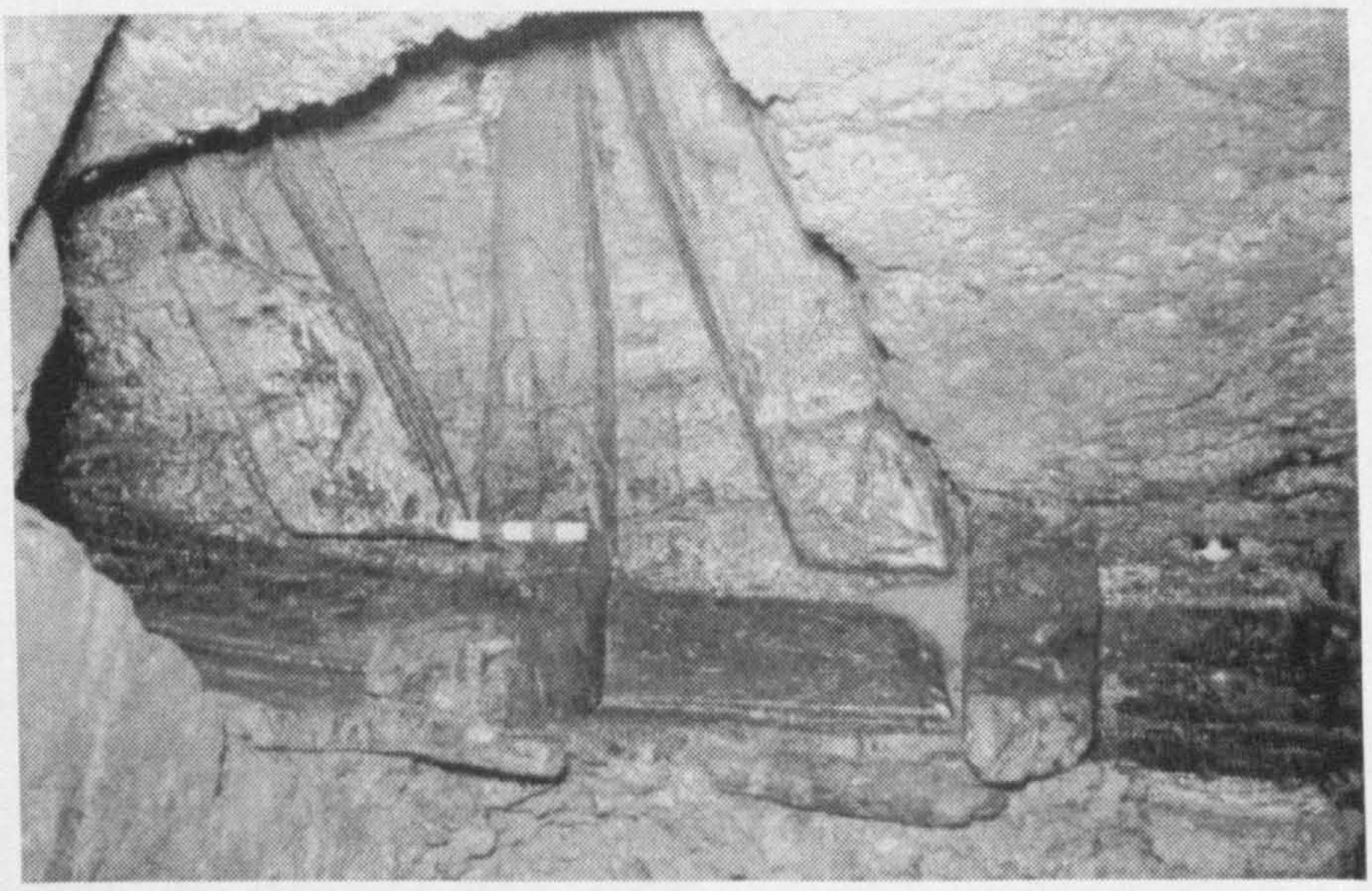


Figure 3.16. The excavated remains of the New Guy's House boat. (Marsden)

It seems that the remains were part of a broad, barge-like vessel, constructed entirely of oak, with caulking of hazel shavings in fine resin being used between the planks. As is usual in this tradition, the planks were attached to the frames by iron nails with flat heads and square shanks, the points being bent over their inboard faces. As only one end, and part of one side, were excavated, only a tentative reconstruction of the entire vessel has been possible but, by analogy with Romano-Celtic barges found on the Rhine, it is probable that both ends were pointed. It has been calculated that the vessel had a total length of at least 16 m, a beam of some 4.25 m and a height amidships of about 1 m. With such limited freeboard, it is clear that the vessel could not have been used in the open sea, and was probably a river barge designed for use in the shallows of the Thames and its tributaries. Later excavations in the creek in which the vessel was found abandoned revealed a low quay, and it is reasonable to assume that the barge was used there (Heathcote 1990, 193). It has been calculated that the barge could have carried a load of about 6 tonnes and, as there was considerable evidence of damage and repair, it is probable that the vessel had been abandoned due to old age. The abandonment of the boat probably took place at the end of the 2nd century, as pottery sherds found in the silt were dated to about AD 190-225, and dumps of rubbish in the creek just north of the boat date from a similar period (Marsden 1994, 97-104).

Local boats

Small craft on the coasts and rivers were numerous, used not only for fishing and local transport, but also for transporting goods up-river from larger coastal and sea-going vessels. The remains of some, such as the Hasholme log-boat, the Brigg raft and the Dover boat, survive in the archaeological record, and are from an earlier period, but their descendants continued in use during the Romano-British period and after, and are therefore described below. Others, such as the various forms of skin-covered craft, do not survive, but are recorded by classical writers in sufficient detail to provide evidence of their form and function.

Coracles

Hornell describes the coracle as "being the most suitable form of craft known to man, whether he be net fisherman or angler" and considers that it is a far older form than the curragh, being derived from the same common source as the ancient skin covered craft of Iraq, India and Tibet (1946, 111-116). The load-carrying capacity of such a small craft is emphasised by Waters (1949, 57-8), who recalls travelling as a passenger in a coracle, and comments that his twelve-and-a-half stone "added only a couple of inches to the draught of the vessel". He also records the comments of a certain Thomas Powell who owned a shallow draught coracle with a cut-down gunwale, but still maintained that it once carried "a man, a boy, a hundredweight of coal and a gallon of water, to within an inch of the gunwale" (1949, 94). The coracle had disappeared from the rivers of Wales and the Marches, but the tradition has been revived and coracles are again being made.

Figure 3. 17. Ironbridge coracle on the River Severn (Hornell)

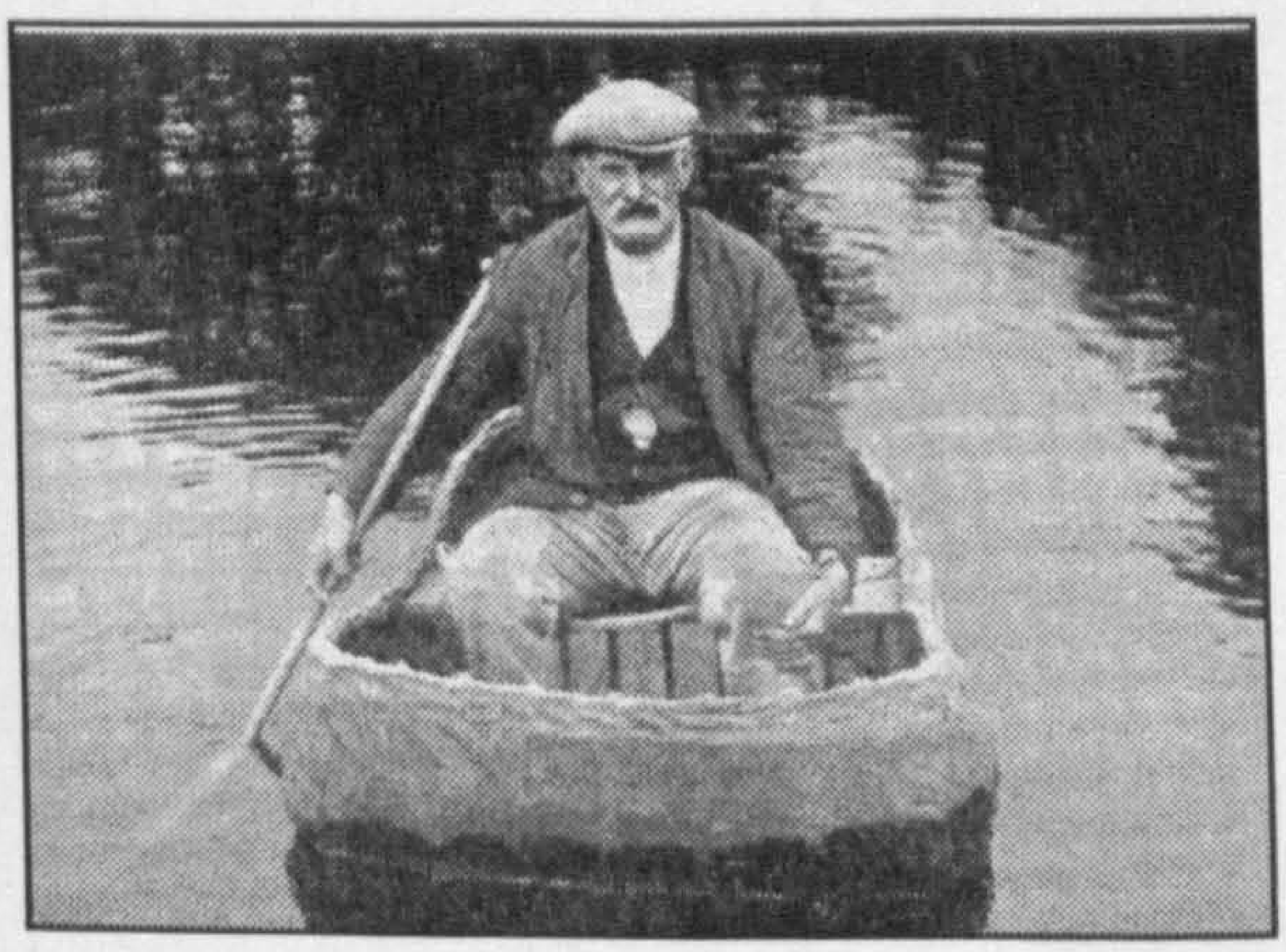


Figure 3. 18. Welsh coracle on the Afon Teifi (Hornell)

Log boats and plank boats

Boats of these types were in use both well before, and well after the Roman period, and investigated and published in great detail, in particular by Sean McGrail (1978, 1981a, 1998). Therefore, this is not the place to attempt more than a brief description of some of the archaeological remains found in this country, in an attempt to create a picture of the types of craft in use on the estuaries and inland waterways of Roman Britain.

Brigg logboat

Probably used in the tidal creeks and rivers of the Humber estuary to ferry people and goods, a log boat dating from c. 850 BC was found in 1886 (*Figure* 3.20) at Brigg near the River Anchormen, but the excavated remains were destroyed in fire during an air raid on Hull in 1941.

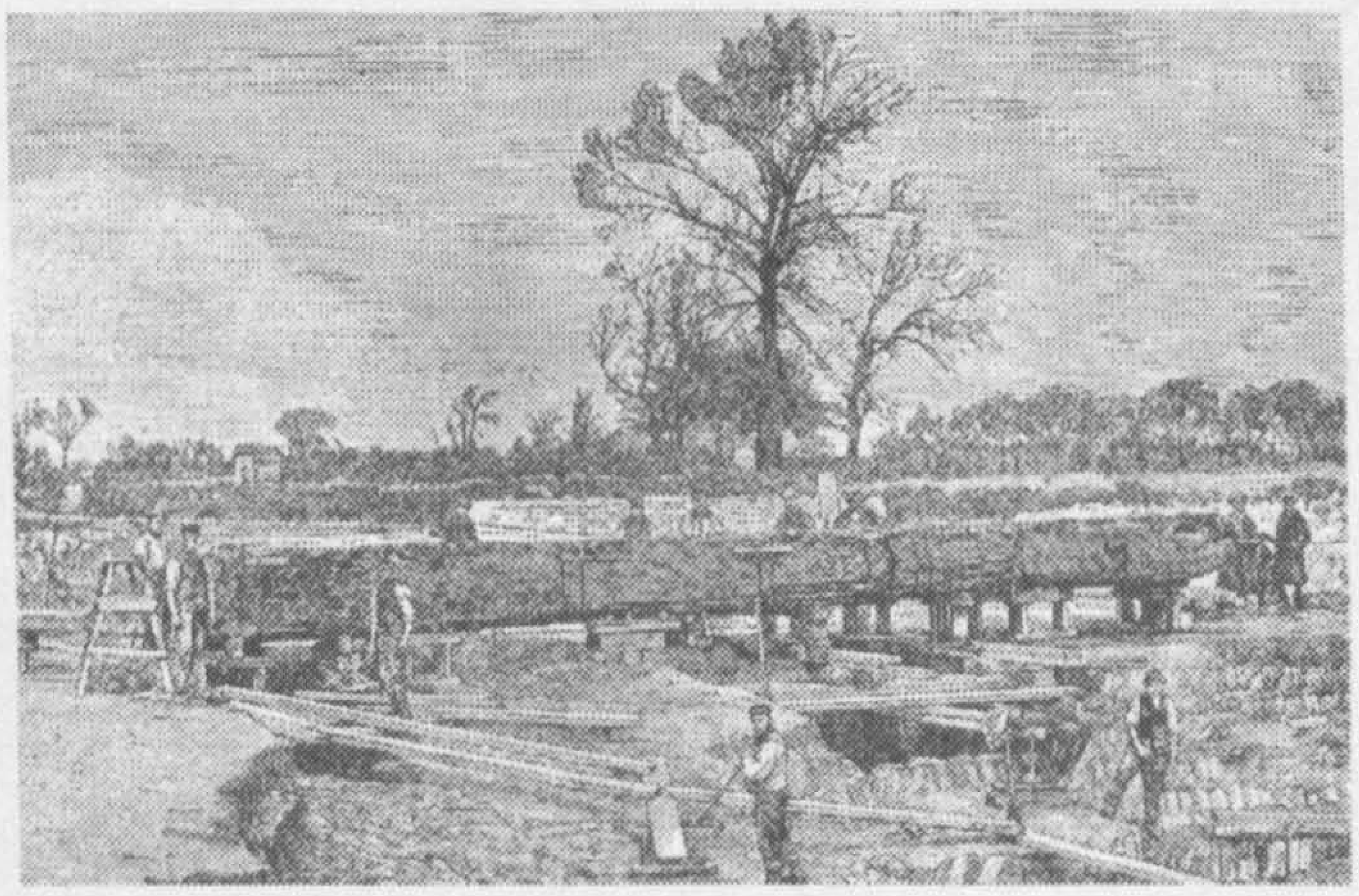


Figure 3.19. The Brigg log boat after excavation in 1886 (E.V. Wright)

Made from a log some 15 m in length and almost 2 m in diameter, 90% of the log had been hollowed out to produce a boat 15 m in length, 1.5 m in depth and about 1 m deep at the stern. McGrail has calculated that the boat could have carried 2 men standing and 26 kneeling paddlers at a draft of only 0.36 m. With a cargo of 5.5 tonnes and crew of five, the draught would have been c. 0.6 m, with a freeboard of 0.1 m (1981, 16-17).

Hasholme logboat

Similar in construction and design to the boat found at Brigg, the Hasholme logboat (Millet & McGrail, 1987, 69-155) was excavated from land at present below sea level, where there had once been a tidal creek of the Humber estuary (*Figure* 3. 21). Dating from c. 300 BC, at 13 m the boat was slightly smaller than the Brigg long boat, but probably carried out a similar role in the area of the Humber.

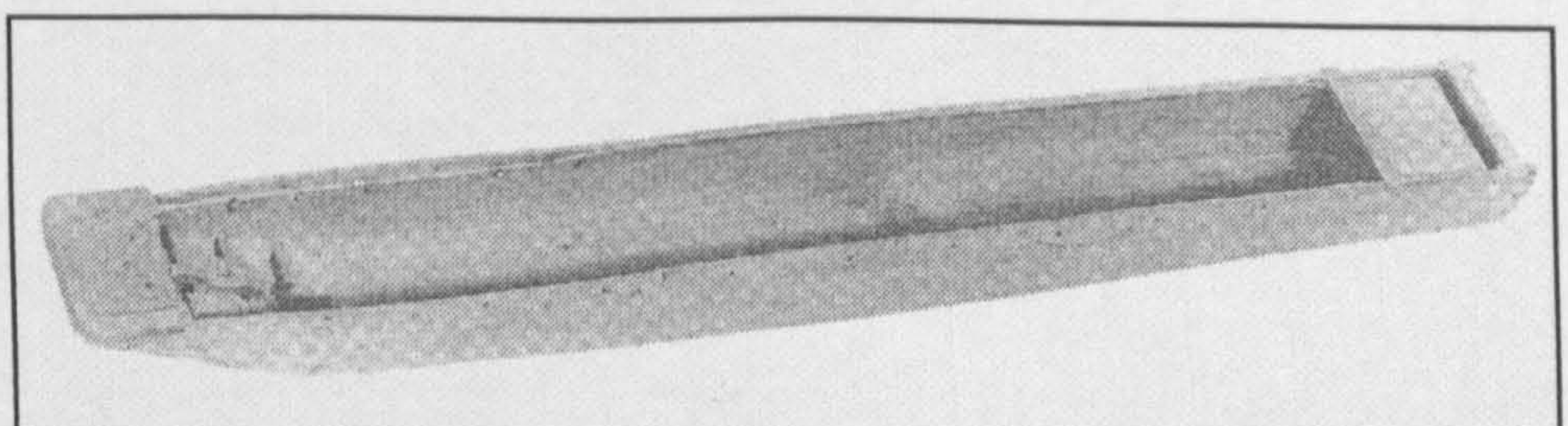


Figure 3.20. A 1:10 reconstruction model of the Hasholme logboat. (Institute of Archaeology, Oxford)

Iron Age or Roman boats have been recovered from Fiskerton near Lincoln, in the Witham Valley, the best preserved is a vessel 7 m long with a slotted transom board inserted into the hollowed tree trunk and is similar to the Hasholme boat from Humberside.

The Ferriby plank boats

The remains of three sewn-plank boats were found in the inter-tidal zone of the River Humber at North Ferriby and were excavated (*Figure* 3.22) between 1937 and in 1963 (Wright 1976). Probably used as a ferry in the Humber Estuary and its tributaries, Ferriby 1 (of which the most remained) was c. 15m in length and c. 3 m at its widest part with a depth of c. 0.7m.

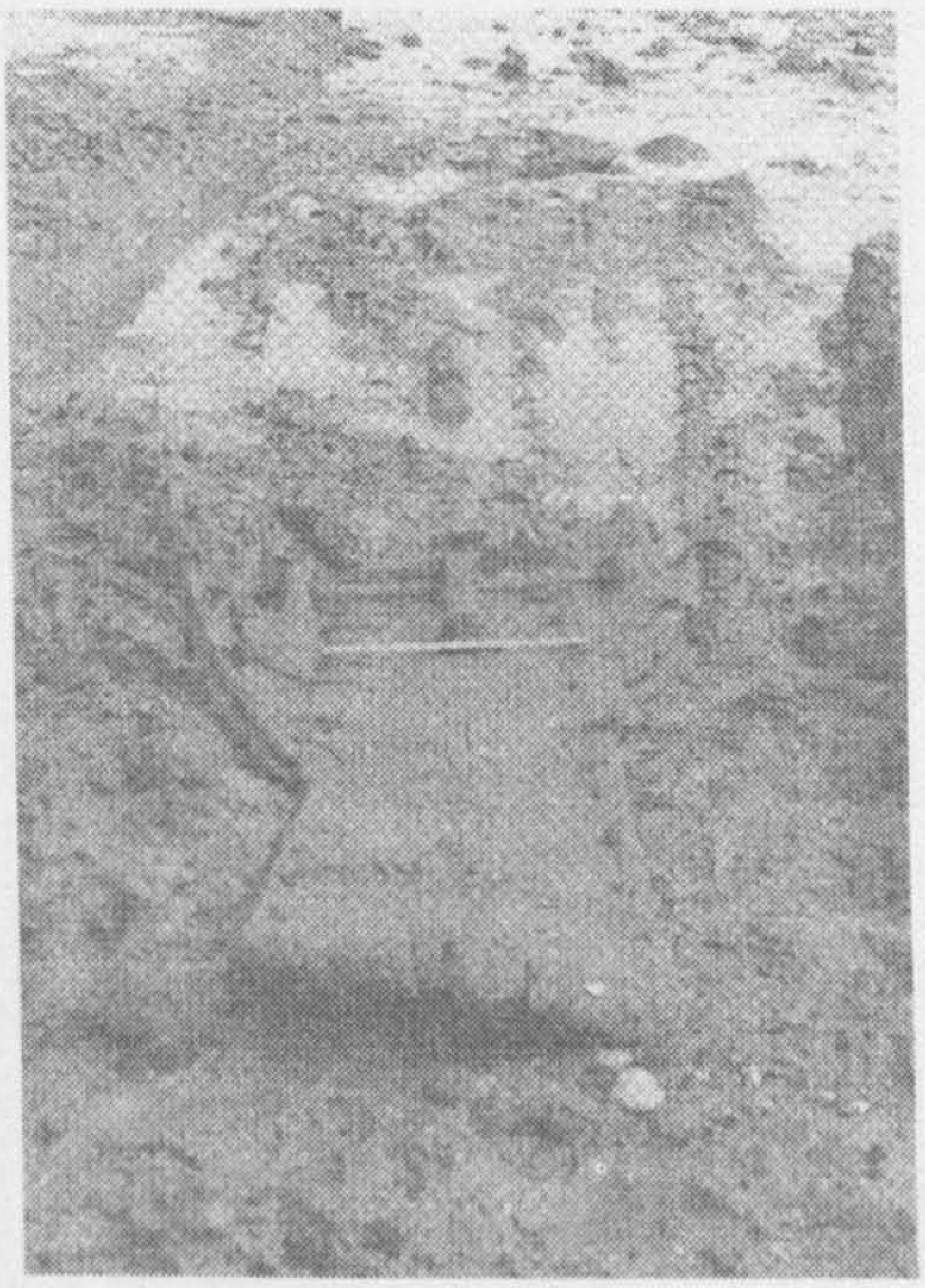


Figure 3.21. Ferriby 1 on the foreshore of the River Humber in 1946. The ruler in the photo is 60cm long (E.V. Wright)

As reconstructed (*Figure* 3.23), McGrail has suggested that, with a maximum load of 5.5 tonnes, this boat was capable of being paddled or poled in calm waters with draft of 0.3 m and a freeboard of 0.26 m. Perhaps surprisingly, he has suggested that this boat "may be compared with the 3rd century AD Barland's Farm boat working in the Severn Estuary". Reference to the description of this boat given above will make it quite clear that the only features in common are a flat bottom and a planked keel, and this perhaps reflects a pre-occupation, by the researcher, with "construction" at the expense of "function".

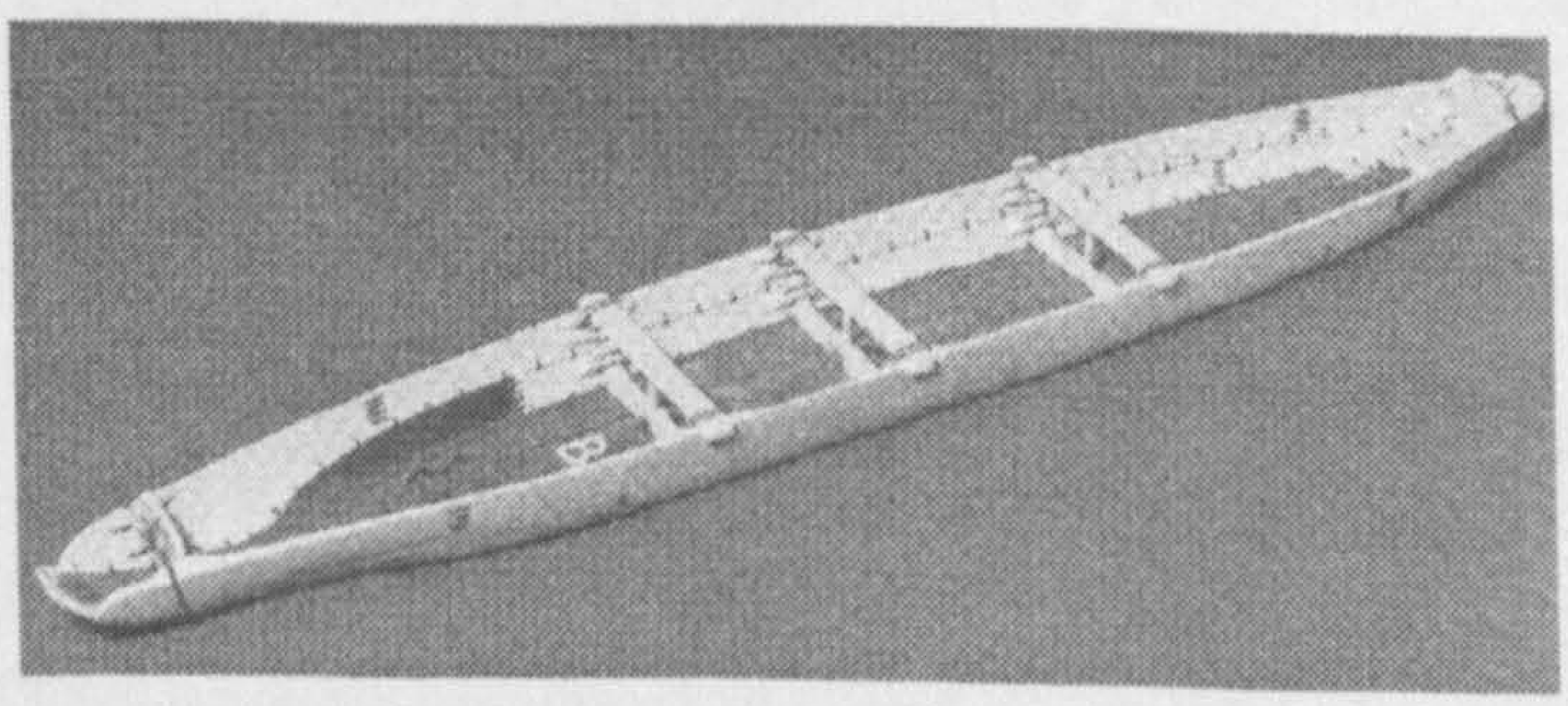


Figure 3. 22. A 1:10 reconstruction model of Ferriby 1 (National Maritime Museum)

The Brigg "raft"

The Brigg "raft", dating from c. 700 BC was found in 1888 and part of the remains were lifted, but the remainder re-interred. Re-excavation in 1974 revealed a flat-bottomed boat, some 12 m in length with a maximum beam of c. 2.5 m and a depth of c 0.5 m, constructed from sewn oak planks with moss caulking.

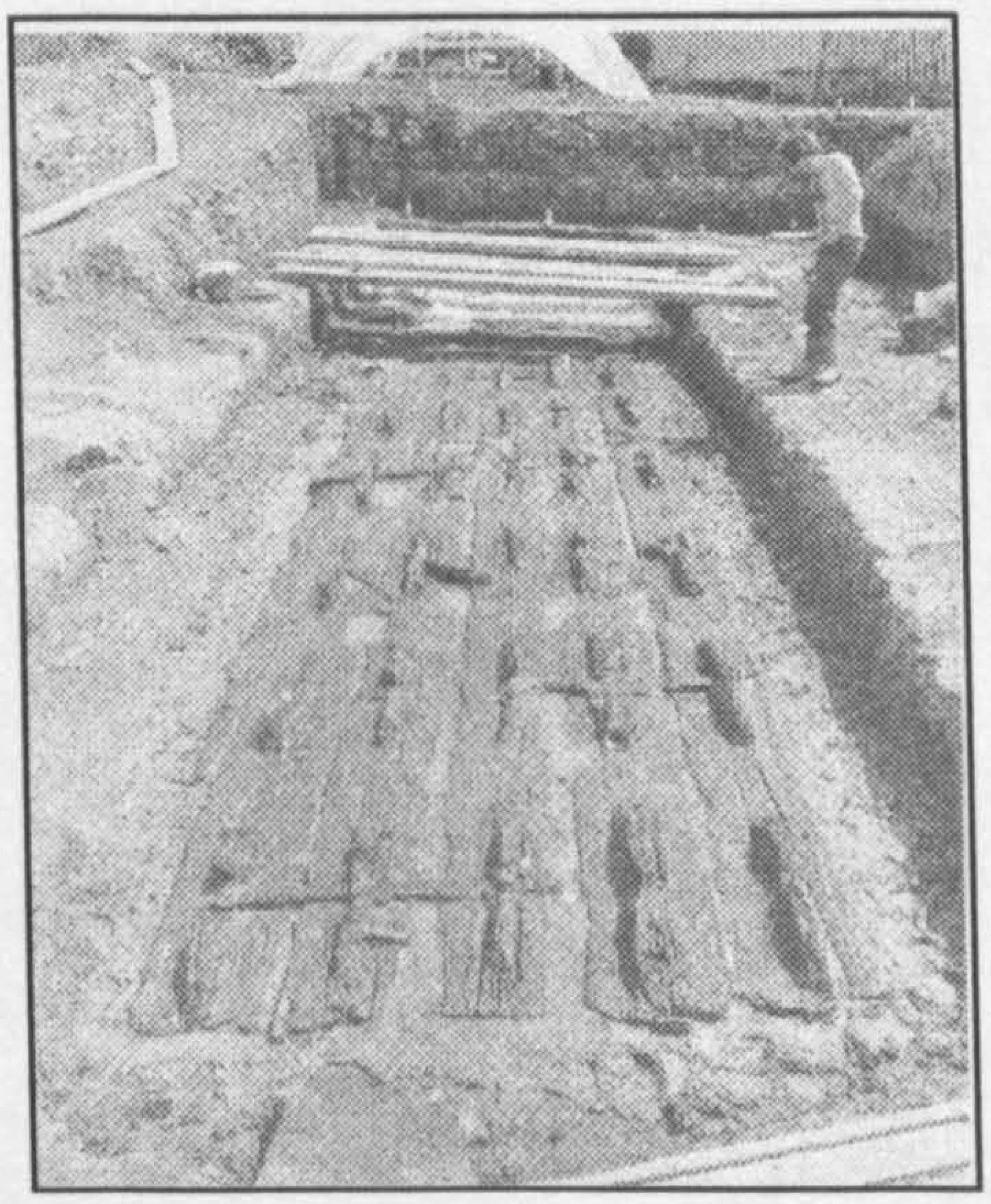


Figure 3.23. The Brigg raft under re- excavation in 1974

McGrail (2001, 187-8) has suggested that it could have "carried loads varying from twenty-six sheep with four men (1.54 tonnes at 0.25 m draft) to seventeen cattle with six men (7.16 tonnes at 0.46 m draft)".

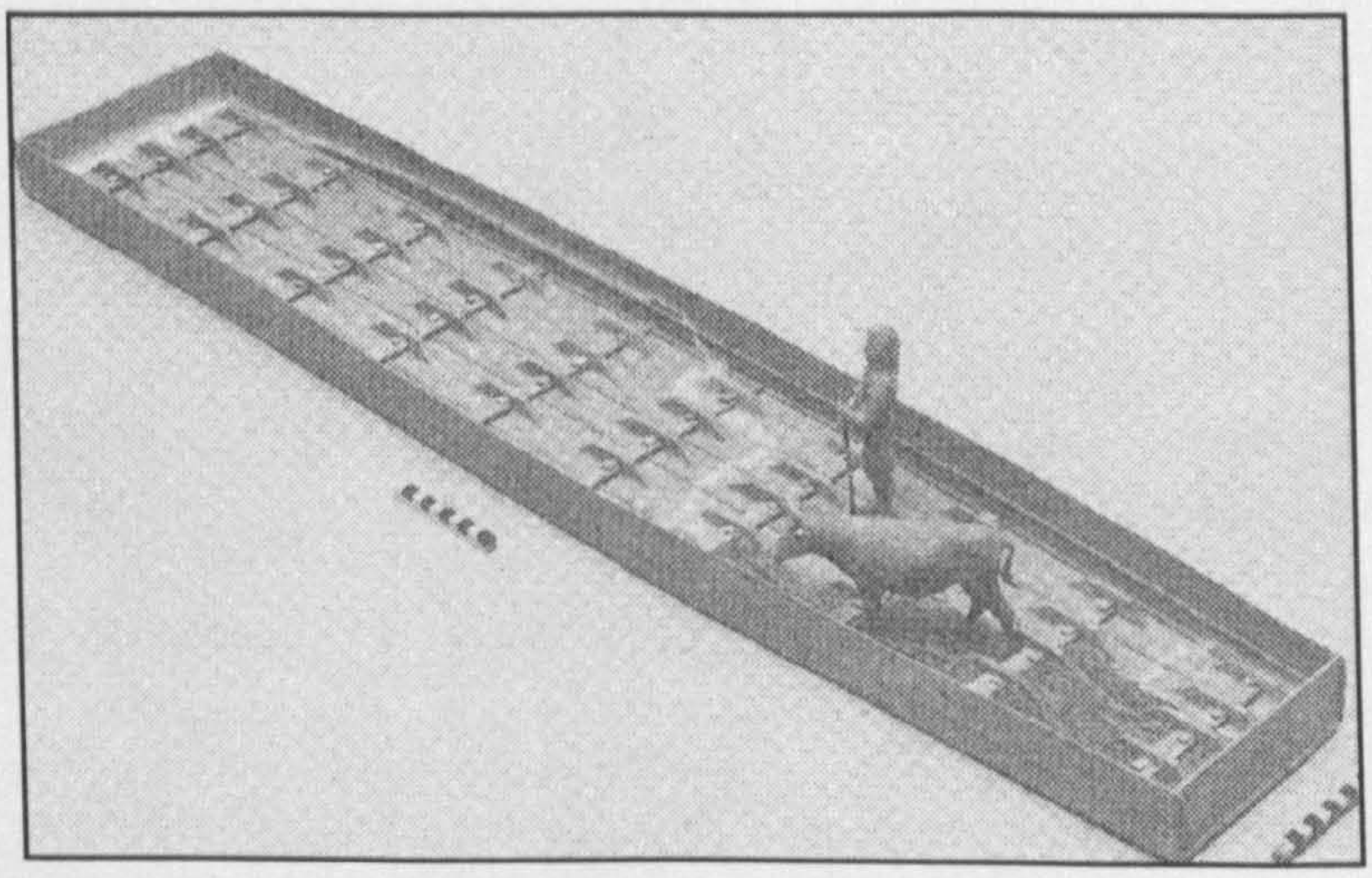


Figure 3.24. A 1:10 reconstruction model of the Brigg "raft".
(National Maritime Museum, Greenwich)

Conclusion

The Roman merchant fleet included both shallow-draught vessels capable of carrying heavy loads, and efficient seagoing sailing ships capable of loading large cargoes. The average cargo capacity of Roman ships was not exceeded until the 15th century, and that of the largest ships not until the 19th century (Greene 1986, 25). At the time of the Claudian invasion, Roman naval and merchant mariners were clearly capable of dealing with Atlantic conditions, as were the ships in which they served.

It will have been noted that no attempt has been made to introduce the topics of passage planning or theoretical journey times. In the case of the fleet operations in support of the landing of AD 43, this has been well examined, in particular by Grainge (2002). However, the waters of the Bristol Channel, St George's Channel and the Irish Sea present very different problems to those experienced in the English Channel, or other British waters. For example, the Bristol Channel has an exceptionally high tidal range of some 13 m, second only to the Bay of Fundy, off Newfoundland. This not only means that many of the sand banks, such as the Gore Sands in Bridgwater Bay, are exposed for long periods, but pose a significant hazard to navigation when covered. The majority of landing places in the study area do not have deepwater facilities and, for example, on the River Axe it is only possible to leave the river or to return to it, some two and a half hours before or after high water. A further consequence is that tidal streams may flow at up to 7 knots in certain areas, as shown on the Admiralty Tidal Stream Atlas (Appendix 11), and even with a modern high-performance yacht, progress under sail against the tide is slow. The tidal effect may be either advantageous, or disadvantageous, as is well illustrated by passages upriver from the mouth of the Bristol Avon to Gloucester and the return journey downriver. By leaving the mouth of the Bristol Avon with the incoming tide ("the first of the flood"), vessels could often reach Gloucester on a single tide in about six hours, since they were "riding the flood" for much of the way. However, a return passage was a much slower journey, because of a combination of tidal and riverbed conditions. A vessel at Gloucester could not travel against the incoming flood tide, and therefore could not leave until about high water was reached, by which time the tide at Sharpness had already been ebbing for two hours. This led to lowered water in the upper reaches, and meant that vessels were unable to cover more than about 10 miles from Gloucester on the first ebb. In the case of a neap tide, combined with a low river flow, a vessel would sometimes get no further than Stonebench, some four miles below Gloucester. A vessel could only cover about a further four miles on the second ebb to Framilode, where there was a reasonable anchorage. About eight miles could be covered in the third tide, finishing near to Arlington, or on occasion to the rock shelf at Hock Cliff. Below this point, the estuary widened and deepened, enabling the mouth of the Avon to be reached on the fourth tide (Green 1999, 139). Some examples of passages made under sail in the study area, further illustrating the problems encountered, are to be found in Appendix 9.

From the above, and based on the writer's personal experience of sailing in the area, it is suggested that theoretical passage plans, based on vessel performance are largely irrelevant, and that, in the study area, the skipper of a Roman sailing ship was, to a large extent, dependent not on the sailing characteristics of his vessel, or the competence of his crew, but on the prevailing weather and tidal (see Appendix 11) conditions.

Chapter 4. Supply and provisioning of the Roman army.

Introduction

In any examination of the extent of water transport in the study area, and, in particular, the area we now know as Wales, it is immediately apparent that the topic is dominated by the requirements of the Roman army. The conquest of Wales covered a period of thirty years; no attempt will be made to cover the campaigns in any detail as they have been comprehensively dealt with elsewhere (Nash-Williams 1954; Jarrett 1969, 1994; Manning 1988, 2001.). The purpose of this chapter, after a brief introduction to the military situation in Wales, is to outline the logistics of the Roman army and to consider the problems of supply and replenishment, with particular reference to the provision of food.

The question of provisioning the Roman army in Wales may be divided into a period of conquest, and then of consolidation. In the period of conquest, lasting from AD 47 until the final subjugation of the Welsh tribes c. AD 78, the logistical problem was that of provisioning an army comprising two legions and a number of auxiliary regiments (perhaps 15 to 20,000 men), operating against a determined enemy, waging guerrilla warfare over mountainous terrain. It will be argued later that the Roman fleet and its associated supply vessels performed a vital function during this period, by not only transporting provisions and supplies to the forts by sea and river, but also by acting in cooperation with the land forces in what are known today as "combined operations". The campaigns of Agricola in AD 78 brought the wars in Wales to an end, and Roman policy changed from offensive military operations, to a system of army control based on some 40 forts (*Figures 10. 1-3)*, sited at strategic points throughout Wales and the Marches. The period of consolidation saw Romanisation taking hold in South Wales, and the establishment of a civilian administration, based on the development of Caerwent (*Venta Silurum*) and Carmarthen (*Moridunum Demetarum*) as tribal capitals (*civitates*) of the Silures and the Demetae. However, the greater part of mid and north Wales comprised a sparsely populated landscape, with difficult land communications operating over rugged terrain. There was, however, the necessity to exploit the mineral resources of the area and to raise tax revenue, and the forts provided a framework for Roman administration, in an area that lacked any form of urban development. During this period, all the forts saw some form of rebuilding in stone, and both *civitas* capitals constructed the range of buildings, such as Forum, Basilica and Baths, that formed the essential public display of Roman civilisation. It will be suggested later that this was the time of maximum use of water transport, not only in providing essential supplies to the towns, forts and associated settlements (*canabae* and *vici*), but also in providing a "heavy lift" capability for stone, beyond the capability of wheeled or pack transport. In response to the demand for a greater number of troops in northern England, needed for the construction and garrisoning of Hadrian's Wall, from about AD 125 there was a significant reduction in the Welsh garrison.

By the middle of the century it is probable that only the fortresses at Caerleon and Chester (with reduced garrisons), and the forts at Caernarvon, Caersws, Forden Gaer, Brecon Gaer, Loughor, Neath and Cardiff continued to be occupied.

Supply Lines

The use of "lines of supply" (a continuous connection between the sources of supply, and the army in the field) is a major characteristic of Roman army logistical support. Their routine use is reflected in the expression, *commeatus*, sometimes used alone and sometimes with various permutations of *veho* and *porto*; corresponding closely to the modern use of the term "supply line". Vegetius commented, "Among the things particularly incumbent upon a general is to see that the transportation of grain and other provisions is rendered secure from hostile attack. The only way to achieve this is to plant garrisons at suitable points through which our supply-trains pass. These may be cities or forts. If no fortifications are available, temporary forts are established in favourable positions and a number of infantry and cavalry stationed in them on outpost duty to provide safe passage for supplies." (*Mil.* 3.8).

An "operational" base was located at the point at which supplies were gathered, within the area of operations and, usually located on a port, contained storage and warehousing facilities to hold supplies to support the army through the campaigning season. As in so many other cases, the Roman army's innovative approach to military problems was not followed by later European armies until the late19th/early20th century, when it was mirrored by British Imperial army usage, with each Command, whether within the United Kingdom or overseas, being served in by its own Base Supply Depot. In the study area, this function was probably fulfilled by the chain of legionary fortresses during the period from c. AD 55 to c. AD 79. Kingsholm was established under the Governorship of Osturius Scapula (AD 47-52), Usk under Didius Gallus (AD 52-57), Gloucester and Wroxeter under Trebellius Maximus (AD 63-69), and Caerleon and (probably) Chester under the Governorship of Julius Frontinus (AD 74-78). A "tactical" base was usually located a short distance behind the army in the field, or within the marching camps. Whilst on campaign, the Roman army built and fortified a marching camp every day it moved, and this often served as its tactical base, providing functions similar to an operational base, but located in the direct vicinity of the enemy. The tactical base usually moved along with the army's advance or retreat, and performed a similar function to the Forward Supply Depots of the British Imperial army. In the study area several marching camps, such as Caerau, Coelbren, Y Pigwn and Pen-y-Coedcae of c.15 ha. were probably constructed by "battle groups" whilst on campaign, and there are at least twenty-four marching camps of 6 ha. or more in size, for example, St Harmon (7.1 ha.), Esgairperfedd (6.5 ha.) and Nantmel (6.9 ha). The 25 ha. camps at Brampton Bryan and Blaen-cwm-bachin are unusually large, and perhaps represent "forming up" points for elements of one or two legions, together with associated auxiliaries, prior to dispatch on campaign. However, there is some evidence from Wales that, when not actively engaged on campaign, the army constructed a number of large semi-permanent forts such as the 18.6 ha. site at Rhyn Park to the east of Llangollen. Probably dating from the late AD 50s, the site is strategically located between the Shropshire/Cheshire plain and the North East uplands of Wales, and may have been developed from a temporary camp into a campaign base by the building of a timber reinforced rampart and gate towers. There is also a cluster of this type of fort near to Hay-on-Wye, with the 7 ha. site at Clifford being succeeded, because of flooding, by the nearby fort at Whitehouse Farm (also 7 ha.), which was itself replaced by the 10.4 ha. site at Clyro, where excavation has revealed the existence of stone foundations for a number of buildings, and a substantial stone-based wall and ditch.

The soldiers' rations

In contrast to other ancient armies the Romans issued regular rations, with the cost of the supplies being deducted from the soldiers' pay, the normal rations for a soldier comprising bread, meat (either fresh veal or pork or salt pork), wine and oil. On active service biscuit *(bucellatum)* was partially substituted for bread, and sour wine *(acetum)* for wine, while the proportion of salt meat was increased; the diet laid down in AD 360 was two day's biscuit and one of bread, wine and vinegar on alternate days, and two days veal and one day's salt pork. A 6th century AD Egyptian papyrus contained the following rations scales; three pounds of bread, two pounds of meat, two pints of wine and an eighth of a pint of oil per day (Jones 1964 III, 191-2). This is significantly more than the daily ration of two pounds of bread, one pound of meat or cheese, and one pint of beer issued during the English Civil War. Grain *(frumentum)* accounted for the major part of the Roman civilian diet; this was equally true for the Roman soldier, and indeed the word *"frumentum"* was often used to refer to food supplies or provisions in general. A non-grain ration (*cibaria*) was issued in order to provide sufficient proteins, vitamins and other nutriments to maintain fighting fitness. The basic grain ration was supplemented by meat, vegetables (especially legumes), cheese, oil, vinegar, salt and wine, the *Codex Theodosius* (7.4.6) confirms this by stating that the soldiers' rations, in addition to biscuit or bread, included salt pork or mutton, wine, vinegar, oil and salt.

Davies (1971, 136) suggested that, in peacetime, the diet of the Roman soldier would have resembled that of the local population, as the surrounding area usually provided most of the garrisons' food. King (1984, 187-217) argues that there was a distinct Roman military diet influencing the surrounding civilian diet, rather than vice versa, pointing out that, at Augusta Raurica, the military diet was remarkably similar to that of civilians. There is no difference, for example, between the meat from domesticated and wild animals, poultry, oysters, edible snails and fish eaten by the legionaries at Vindonissa, and that eaten by the civilians. The evidence of *tituli picti*, for various other items of food is remarkably similar (Callender 1965, 37-41). The diet revealed by the archaeology of British forts is on a par with that eaten in the towns, villas and Romano-British settlements, and often superior, with food being adequate in quantity and quality.

The recent discovery, and subsequent decipherment, of the Vindolanda tablets (Bowman & Thomas 1984; Bowman 1994), has made a significant contribution to our knowledge of the problems of supply and demand in northern Britain, and we now have clear evidence that a combination of purchase, requisition and direct production met the basic needs of the Vindolanda garrison. Whilst it would clearly have taken several years during the Flavian period to develop an effective transportation network, it is clear from the Vindolanda tablets that it was relatively easy to order items that could not be obtained locally. However, a reference to a wagonload of hides, of which the writer says, "I would have already been to collect them except that I do not care to injure the animals while the roads are bad" indicates that transportation, particularly in the winter, might be difficult. There is evidence that some of the cereals consumed were produced from agricultural land under the direct responsibility of the fort, but private enterprise is indicated by the activities of local merchants and, in particular, a reference to a purchase of 5000 *modii* of grain indicates that significant quantities were purchased (Tablets Vindolanda II 343). Local brewing of Celtic beer using the cereal *bracis* is probable because of a reference (*ibid.*186) to a brewer (*cervesarius*). One letter (*ibid.* 302) refers to the purchase of 20 chickens and an instruction to buying good-looking apples (*mala formonsa*), and eggs in large quantities "if they are on sale there at a fair price" (*si ibi aequo emantur*). An account of small cash sums is headed *reditus castelli* ("revenues of the fort") and Bowman (1994, 40-1) suggests that this could indicate sales of surplus supplies or goods manufactured in the camp. An internal market existed within the fort, and records indicate the purchase of non-essential items including *piper* (pepper), *sebum* (tallow), *sudaria* (napkins or towels), *coturnii* (boots), *sagaciae* (cloaks) and *superariae* (overcoats).

Examination of the bones of domestic animals from Roman military sites in Britain shows the consumption of ox, sheep and pigs at every site, and goat on many. Some of the bones were from immature animals, indicating the consumption of suckling-pig, veal and lamb. The various livestock kept on site would have provided a supply of milk, from which cheese could have been made; cheese-squeezers have been found at Corbridge and Holt. Shellfish were a favoured part of the diet and included oyster, mussels, whelks and limpets, and whilst these would have been readily available for units stationed on the coast, e.g. Carmarthen, Caernarvon or Pennal, oyster shells have been excavated at inland locations such as Brecon, Chester, Hod Hill, Holt and Caerleon (Davies 1972, 122-42). In a storehouse at Caerleon, the carbonised remains of barley, spelt, rye, wheat and oats were found together with lentils, horse beans and various weeds. Most of the weeds were not indigenous to Britain, and so must have been imported with the cereals. Helbaek (1964, 158-64) has concluded that the Romans probably intended to sow the lentils and rye, but that the grain was to be malted to make beer (*cervesa*).

Graffiti and *tituli picti* on amphoras give an indication of the food and drink consumed on military sites. In Britain, graffiti written on the neck of amphoras discovered in a cellar at the military stores depot at Richborough describes *lympa,* a wine from Mount Vesuvius and presumably produced before AD 79 (Bushe-Fox 1949). One of the handles of an amphora at Newstead was scratched *vin(um)* (Curle 1911, 268), and at Mumrills (Wright 1964, 184 No.40) a vessel with the inscription *glukus (oinus),* had contained sweet wine, and another at Caerleon had held *amine*, a high quality white wine (Wright 1966, 224 No. 51). An amphora discovered at Carpow (Wright 1963, 166 No.51) had contained a wine flavoured with hore-hound; one discovered on the Cumberland Coast had come from Esuris in Lusitania (Wright 1955, 148 No.25) and probably contained olives (*olivae*) and a third; from Brough-on-Noe (Wright 1963, 166 No.50), had contained plums (*pruna).*

Although this indicates that the Roman soldier enjoyed a rich and varied diet, many of these commodities would not have been available whilst serving in the field, others such as meat would have accompanied the army "on the hoof". Whether stationed in winter quarters, in times of peace, or later in permanent barracks, many of these items could have been "piggy-backed" on bulk consignments of wheat, or loads of amphoras containing wine or olive oil. These minor products would not have created a significant addition to the volume of transport required, forming only a small part of the major consignment.

Conclusion

In the study area, many forts and settlements are located on the coasts, estuaries and navigable rivers, and therefore provide an excellent case for supply by water transport. Wales in particular lends itself well to this method of provisioning because of its long coastline, the isolation of the forts and, during the early campaigns, the lack of an effective road system. The role of units of the Roman fleet, both in offensive operations and in supplying logistical support for the army, is discussed in Chapter 5, and the types of merchant ships and boats that may have been in use is discussed in Chapter 3. Clearly, water transport played a significant role in the movement of troops and the supply of equipment and rations, throughout the whole of the Romano-British period. However, the amount of traffic varied dramatically over time with, for example, no military installations existing from the late 2nd century on the coastline of Wales between Caernarfon on the north coast and Cardiff on the south coast (*Figure* 10.5). The role of water transport in commerce, trade and industry, together with a probable interface with military supply and provisioning, is discussed in Chapter 8.

Chapter 5. Roman sea power and the Classis Britannica

Introduction

Rome developed from a land-based power at the commencement of the First Punic War (264-228 BC), to a naval power that, after the battle of Actium in 31 BC, exercised complete control of the Mediterranean, and could rightly claim it as *mare nostrum.* Caesar's defeat of the Venetic fleet in 56 BC (*BGall.* 3. 9-13) had eliminated any threat to naval supremacy on the Atlantic coasts. The conquest of the Northern Provinces was eased by the development of fleets capable of close support of the army in offensive operations, and equally competent in the transport and supply of the military by waterborne transport. Up until the time of Augustus, naval forces assembled on an *ad hoc* basis, usually for a specific campaign, raised by the military commander of the operation, but Augustus organised a series of permanent fleets, within a formalised organisational and control structure.

Naval operations played an important role in the civil wars of the first century BC, for example, in 79 BC a fleet of 1200 ships was used to transport Sulla's army across the Adriatic from Greece to Italy (Plutarch *Sulla*, 27.1). Two years later, Scipio needed a fleet of 800 vessels to transport his army of seven legions, and its supplies, from Sicily to Italy (Plutarch *Pompey*, 11.2). After Octavian secured control of the Republic, by his defeat of the fleets of Mark Antony and Cleopatra at the Battle of Actium in 31 BC, major naval battles were a thing of the past. However, Augustus ensured that a strong navy continued in being and, as will be demonstrated later, naval power had a vital role during military operations in Britain.

The Classis Britannica

The transport of personnel

For the whole of the Romano-British period, a major role of the Roman fleet was the transport of military and state personnel, both across the Channel, and around the coasts of Britain. The scale of movement ranged through individual soldiers on posting, to the transfer of complete legions. The range of activity undertaken is illustrated by tasks such as the carriage of members of the *cursus publicus*, the movement of vexillations, transport of units on a routine change of garrison (see Appendix 5), and major operations, as in the case of the Sarmatians, when 5000 heavy cavalry, plus dependants, were transported from the continent. Aside from these somewhat mundane tasks, was the carriage of high status officials, and one of the most eminent of these personages was undoubtedly Claudius, when undertaking his journey from Rome formally to complete the conquest of Britain. "He first had sailed down the river to Ostia and from there he sailed along the coast to Massalia. Thence he travelled partly by land and partly along the rivers until he reached the Ocean. He crossed into Britain and joined the troops who were awaiting him by the Thames" (*Dio.Cass.* 69. 19). To minimise the Emperor's discomfort, during the Channel crossing, probably in a trireme, the maximum possible speed would have been striven for, as "on his way there (Massalia) by ship from

Ostia he was twice almost drowned in storms blowing from the north-west, off the coast of Liguria and near the Stoechades islands" (*Suet. Claud.*, 17).

Starr considered that the "transport of men and materials from the continent to Britain always remained the chief function of the British squadron" (1960, 153). That he should have perhaps phrased this as "to and from the continent" is demonstrated by the number of recorded major movements that took place in both directions. These major movements are important not only in the demand for shipping, but also because of their effect on the "ration strength" of the army in Britain and therefore have been summarised and recorded in Appendix 5. In essence, there appear to have been at least fourteen occasions of significant troop transfer to the continent (often in the service of British usurpers), and at least fifteen major reinforcements (sometimes of returning vexillations) of the garrison of *Britannia.* For example, one of the earlier post-Conquest operations followed a revolt in the north c. AD 117-20, in which a centurion from Vindolanda was killed, resulting in the reinforcement of the British garrison by the despatch of 3,000 troops from Germany and Spain to the Tyne (*ILS* 2726; 2735). By contrast, in the mid AD 140s troops were sent to sunnier climes, to take part in a campaign against the Moors (*AE* 1960, 28). Britain was also a fruitful source of usurpers such as Clodius Albinus in 192 AD, Carausius in 296 AD, Magnus Maximus in 383 AD, each taking a part of the British army to support his campaigns and in turn, each insurrection led to the inevitable crossing of the Channel by an army of recovery. It is clear that, even as late as AD 407, sufficient vessels were available on the south coast, for the British usurper Constantine III to transport enough troops to mount a successful campaign, that resulted in the annexation of Gaul and Spain.

Whilst this only amounts to some thirty major troop movements over a period of 350 years, it would have been necessary to maintain a "fleet in being", ready and able to respond to any emergency. It is of course possible that contracts for the transport of troops were placed with civilian contractors. The "minor" fleets of the Mediterranean were primarily involved in the movement of officials and personnel, and were maintained for that purpose in areas where offensive operations were only a remote possibility. By contrast, throughout the Roman period, the Northern Provinces were seldom entirely peaceful, and it is therefore thought improbable that reliance would have been placed on non-military sources.

A Classis Ivernica?

Whilst accepting that there is no direct evidence for the existence of an independent western British fleet, Mason (2002, 65) draws attention to the fact that the volume of naval activity in the Irish Sea area must have been considerable, but that there are no bricks or tiles with the familiar "CL BR" stamp. He goes on to ask whether a tile found at Chester, bearing the stamp "CLIV", was merely a batch number "154" or, as *Oceanus Ivernicus* was the Roman name for the Irish Sea, whether it was an abbreviation for *Cl[assis] Iv[ernica]*. He further suggests that, when in the 4th century a number of new, so-called Saxon Shore type forts were constructed at Cardiff, Lancaster and Holyhead, Chester would have been "the obvious headquarters for such a separate naval command", and that at this time "there could well have been a flotilla known as the *Classis Devae* at Chester. At first sight these are attractive suggestions but, as the illustration of *Classis Britannica* stamps shows (*Figure* 5.1), naval stamps were quite distinctive, with a period used as a separator (1,2,3), a distinctive surround (4) or the use of the "lazy L" (5,6). It is therefore suggested that a stamp mark showing "CLIV" simply means "154" and that any other interpretation is highly speculative.

In any case, the legionary tile and brick production depot at Holt, just 12 km south of Chester, would have rendered any independent naval production both unnecessary and uneconomic. The suggestion for the fragmentation of the *Classis Britannica* does not find parallels in other parts of the Empire and, in any case, Chester, being tidally dependent, does not lend itself as a major base, and its remoteness from the Bristol Channel (in a different legionary command) makes little sense in the area of command and control. It is far more likely that the army commanders at Caernarfon (or possibly Holyhead) and Cardiff exercised local control of the naval units that were stationed in the areas of the 20th and 2nd Legions respectively.

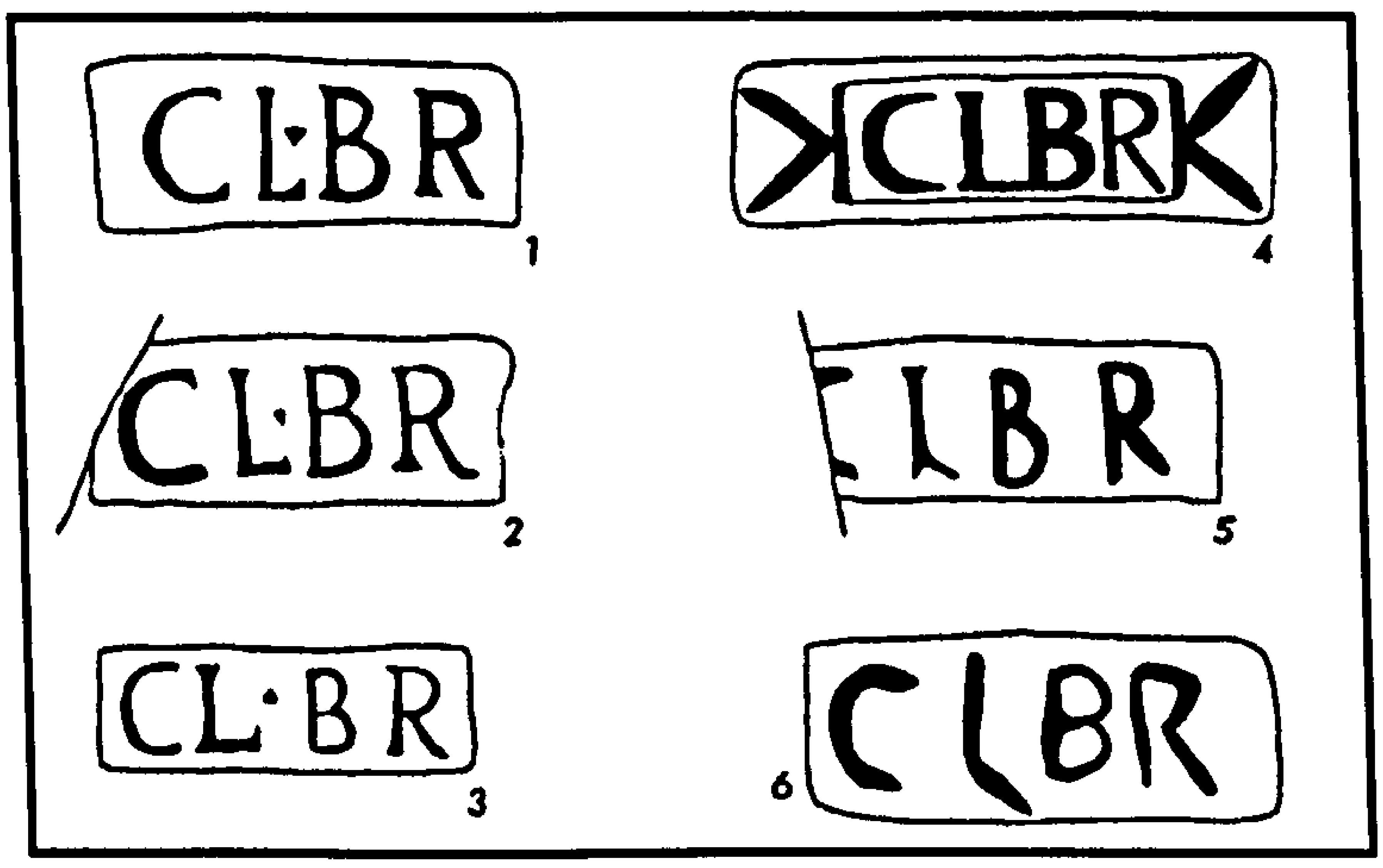


Figure 5.1. Tile stamps of the Classis Britannica. (Peacock)

<u>*The Army's Navy?*</u>

Starr thought "the activity of the German fleet at the mouths of the Rhine was intended not so much to protect Gallic coasting trade, as to guarantee the maritime connection of the German and the British armies" (1960, 175). It has recently been suggested, "The *Classis Britannica* must have been operating in strength as far north as the Solway Estuary and Tynemouth" (Mason 2003, 98), but Starr considered that naval operations in the north were probably by local flotillas under independent commanders. He pointed out that the presence of the *Classis* in the Irish Sea is attested only during the wars of Agricola, and that no naval station on the west coast had been discovered (1960, 175).

Ulpian stated that "in the fleets all rowers and sailors are soldiers" (*Digest* 37, 13) and there is some slight epigraphic evidence to support the concept of naval forces, other than in the south east of Britain, operating under the direct control of the military commander, and as an integrated part of the land forces. Close association of legion and naval vessels is demonstrated at York, where there was an inscription dated c. AD 122, dedicated to *Marcus Minucius Audens* who was described as *gubernator* (pilot) of *VI Victrix* (*RIB I* 653). A memorial from Chester, (*Figure* 5.2) shows that an *optio* of the 20th Legion never achieved his expected promotion to centurion, as he lost his life in a shipwreck.

Figure 5.2. Tombstone of an optio who died in a shipwreck - naufragio perdit - his name does not survive. (Grosvenor Museum)

There is evidence for specialist soldiers/seamen at South Shields, on the mouth of the River Tyne; the 4th century garrison was a detachment of "Tigris boatmen" (*numerus barcariorum Tigrisienium*), and Wilson (2002, 448) suggests that the Roman name of *Arbeia* was possibly derived from the Aramaic word for Arabs (*Arbaya*). From the start of the 2nd century, specialist units accustomed to dealing with the river conditions may have been stationed there. An undated inscription from Lancaster (*RIB* 601) refers to a *numerus Barc(ariorum)* under a *p(rae)p(ositus)* named Sabinus. A bronze discharge diploma dated AD 158, found on the foreshore at Ravenglass (*Itunocelum*), records the presence of *Cohors I Aelia Classica*. *Cohors I Baetasiorum* is recorded on an altar at Maryport (*Alauna*) on the Solway Firth in the late 2nd century (*RIB* 830,837,838,842,843), then under the command of *comes litoris Saxonici* at the Saxon Shore fort at Reculver during the 3rd century (*Notitia Dignitatum* xxviii.18).

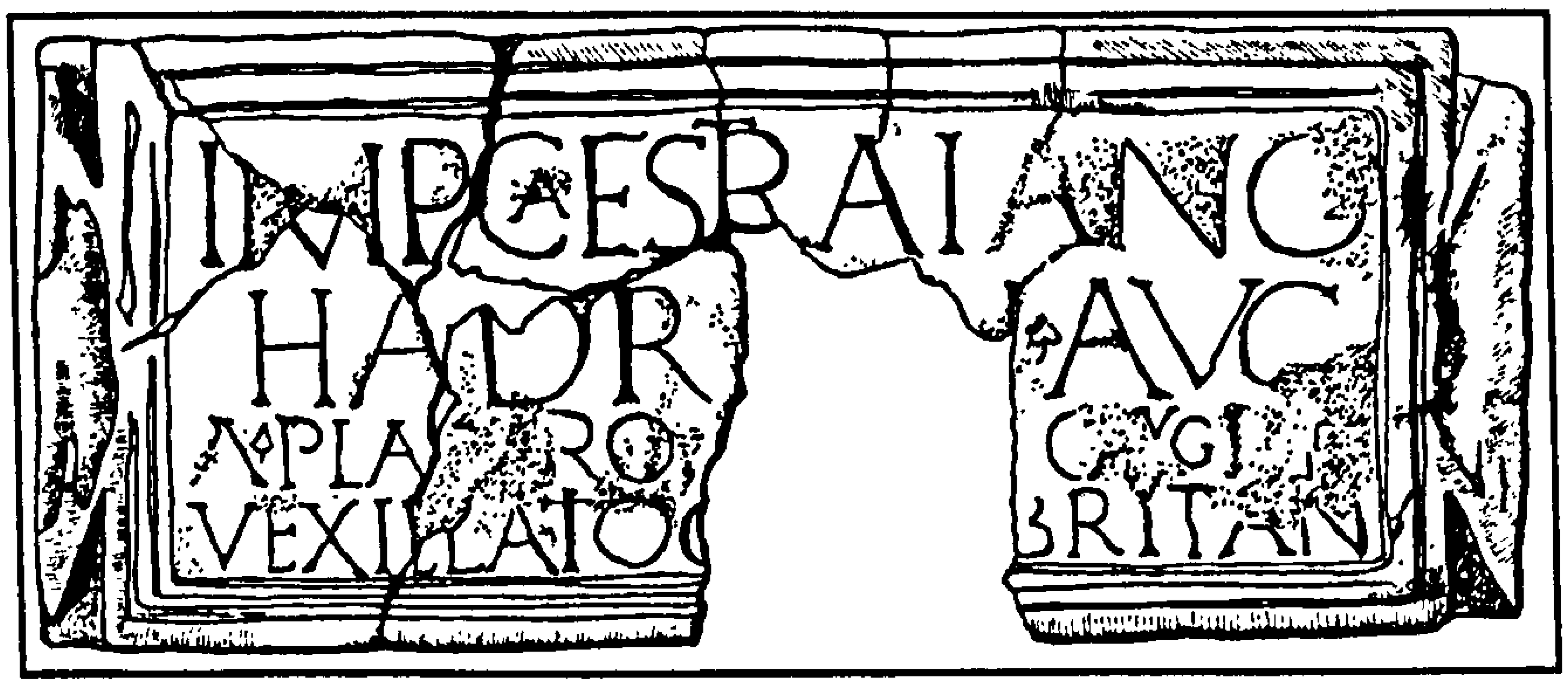


Figure 5.3. Slab from the granaries at Benwell (RIB 1340). The c[lassis] *Britan*(nica) *is the most plausible restoration for the name of the unit. (de la Bedoyere)*

Warships and transport vessels of the Roman Fleet in Britain

Warships (Naves Longae)

There is no archaeological evidence in Britain for ships of the Roman fleet, but in his commentary on the Gallic Wars, Caesar gives considerable detail concerning both warships and transports, and it is unlikely that any significant changes had taken place by the time of the Claudian invasion of AD 43 (e.g. *BGall.* 3. 9-13). Morrison and Coates, quoting Dio Cassius, state that the Roman warships in the sea-battle against the Veneti were "fast ships from the Mediterranean", but Parker believes that there is no evidence that Roman warships made such passages, considers that this is a mis-translation, and that Dio was referring to ships built on the River Loire (1999, 477-8). This view receives some support from Marsden (1994, 175-6) who considers it rare for any Mediterranean shipping to use this route. Warships of Mediterranean type, for example, *triremes* and *liburnae* (see below), were certainly used in the northern waters, and were built locally by shipwrights trained in Mediterranean ship-building techniques. The fact that the warships of the fleets of the Northern Provinces were built locally, should not surprise us. In a later period, many of the warships of the British East India Company were, in armament and design, virtually indistinguishable from the frigates, brigs, sloops, and even "ships of the line", of the Royal Navy. However, they were built in local yards in India, and were colloquially known as "country-built ships".

Casson writes that "Roman writers...... consistently use layman's language when referring to warships, instead of naval jargon, *biremis* for *liburnae*, being but one example. They almost always speak of *triremes*, *quadriremes* and *quinqeremes*, whereas the official terms were *trieres*, *quadrieres* and *penteres* (1994, 7.6).

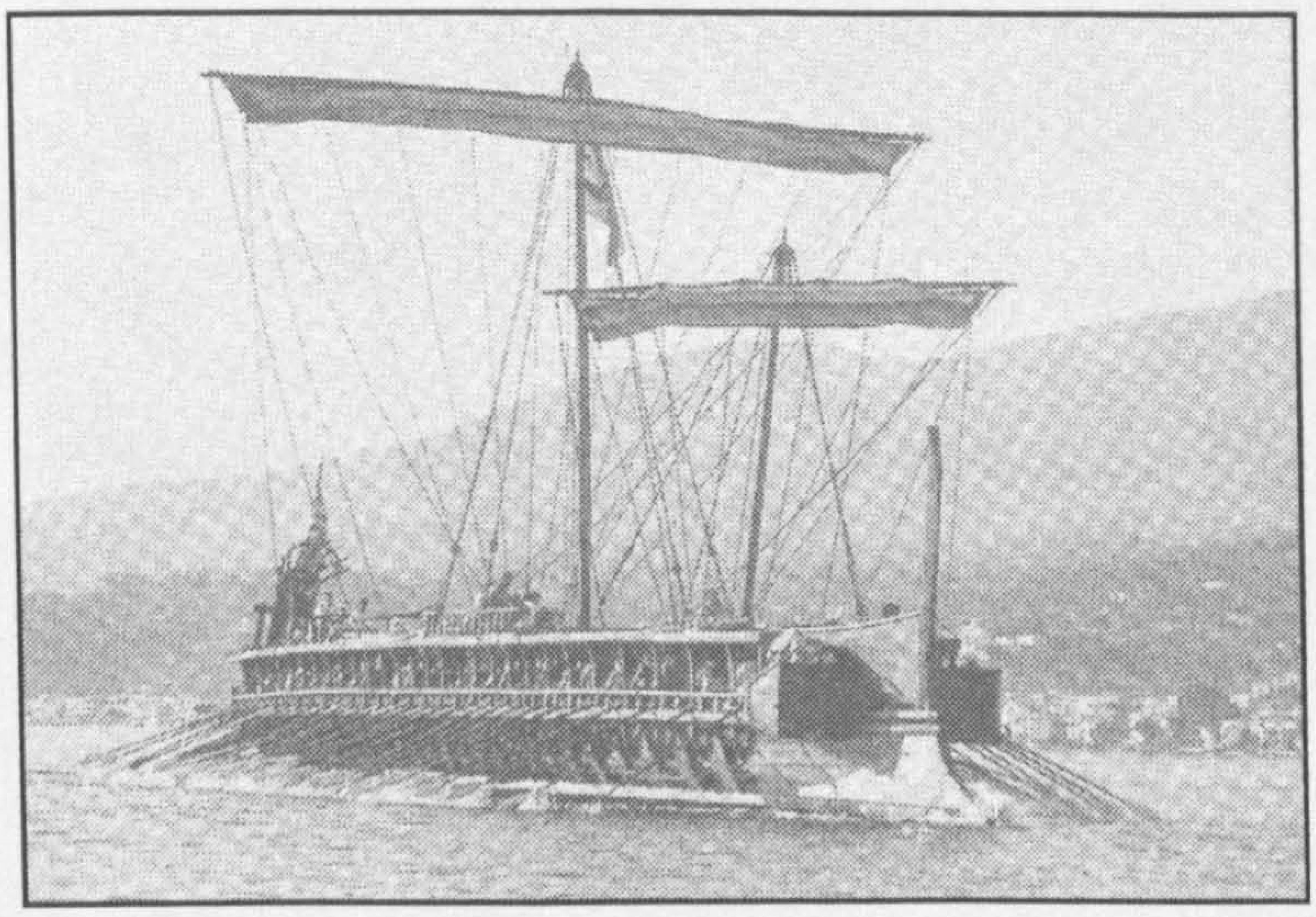


Figure 5.4. The reconstructed trieres "Olympias" under oars (Morrison)

Other than in the description of a mock sea fight in the Fucine Lake, Tacitus makes no mention of a type of warship larger than a *quadrireme* ("four"). This is not surprising, because the battle of Actium had demonstrated the value of the *trireme* ("three") and, in any case, there was no longer another major naval power in the Mediterranean to provide the need for large vessels for use in a fleet action. A major function of the navy was now to serve the Roman armies on the Rhine and Danube frontiers; Tacitus makes a number of references to triremes, for example, in describing how Corbulo "brought up his triremes by the Rhine channel, and the rest of his vessels according to their draughts, by the estuaries and canals" (*Ann*. 11.18.4). There is a depiction of a trireme with three banks of oars on Trajan's column, (Coulston 2001, 119-23).

Although a relief at Boulogne (*CIL* XII 3564) refers to a trireme, the "*Radians*", it is probable that the *liburnian* was the predominant warship in the Northern Provinces. The origin of this type of vessel is described by Appian (*Hist*. 3), who writes of the Liburnians as a maritime people, "an Illyrian tribe, who practised piracy in the Ionian Sea and the islands, with fast, light ships, so that still now the Romans call their light fast two-level warships *liburnae*". Morrison states that the term came to cover a wide variety of two-level oared warships, in some cases equipped with rams, the largest of which rowed twenty-five men on each side, and the smallest had eight oarsmen a side. They were used in a variety of roles including conveyance of dispatches, transport of fleet officers, used as scouting vessels and, when *cataphract* (armoured, decked and boxed-in), able to engage enemy vessels in battle (1996, 263-4). Their sea-worthiness, and use in Britain, is indicated by Tacitus who records how, in AD 83, three *liburnae* were hijacked by a cohort of Usipi, possibly in the Firth of Clyde; then sailed north round Scotland, then southward down the coast, crossed the North Sea and eventually reached the territory of the Frisii on the coast of Holland (*Ag*. 28). On Trajan's Column, three biremes are depicted with large crews, rams, steering oars, outriggers and two banks of oars. Two have large stern cabins and one has a prow richly decorated with tritons and a swan figurehead. There are several other depictions of biremes, one with a spritsail, and one with a lowered mast. Another bireme displays a standing mast with furled sail, mast-stays, hanging ropes, a raised and catted anchor, and a very wide steering oar blade (Coulston 2001, 119-23)

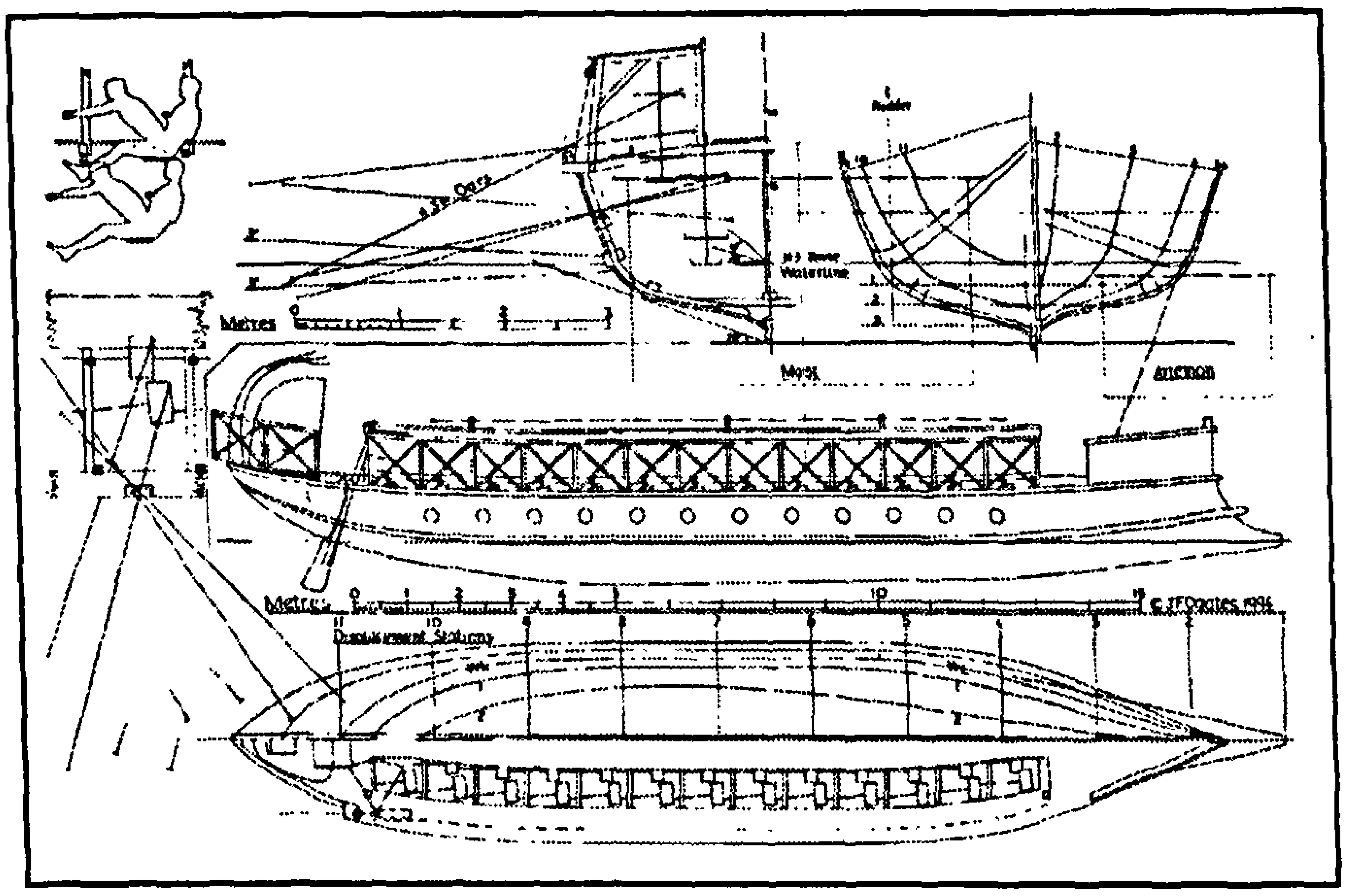


Figure 5.5. Liburnian of the 1st/2nd century AD (J.F. Coates)

Figure 5.5 shows a *liburnian* of the 1st/2nd centuries AD and is likely to be indicative of the most common warship to be seen in British waters. As reconstructed, the vessel is 18 m on the waterline with a beam of 3 m and would displace about 15 tonnes. Sail would be used whenever possible, but Morrison considers that a sprint speed under oars of just over 7 knots should be attainable (1996, 317). Whilst under passage, not all the oars would be manned at the same time, with the rowers (*remiges*) being divided into squads and rowing in shifts.

Whilst Vegetius is not a wholly reliable source, his description of camouflaged scouting craft is of considerable interest. "With the larger *liburnians* may however be associated light scouting boats (*scafae exploratoriae*), which may have about twenty rowers in a single oar-room, and which the Britons call *picatos*. With these, it is customary to surprise and sometimes intercept the supplies of hostile ships, reconnoitre their movements and discover their plans. But as their whiteness would show up at a distance, their sails and ropes are tinged a green colour, which is like the colour of the waves, and even the wax composition, with which their hulls are dressed are similarly coloured. The seamen and soldiers are also clothed in the same colour, for better concealment on scouting duty, not only at night but also by day" (*Mil.* 4, 37). There has been some discussion on the exact rendering of this passage (Dove 1971, 15-20; Gauld 1990, 402-406; Parker 2004, *pers.com.*), but it is perhaps surprising that the effectiveness of either green or blue as a camouflage, for vessels operating in the grey waters of the North Sea, has received no comment. From the medieval period, vessels usually were brightly coloured, but when various schemes of camouflage have been used by modern European navies, a shade of grey, to blend in with the colour of the sea, has generally been considered the most suitable.

Transport vessels (onerariae/vectoria navigia/lembos/ceraerus/cybea)

For his first expedition to Britain, Caesar did not build transport ships, but requisitioned them in Gaul (*BGall.* 4.21), but for his expedition the following year he had some 600 new transports built. He specified that they were to be beamier and of lower freeboard than those used the previous year, and were to ship oars, as well as sails (*ibid.* 5.1-2). For the naval expedition of Germanicus, from the Rhine to the Ems in 15 AD, "1000 vessels were considered enough, and these were built at speed. Some were short craft with very little poop or prow, and broad-bellied, the more easily to withstand heavy seas: others had flat bottoms, enabling them to run aground without damage; while still more were fitted with rudders at each end, so as to head either way the moment the oarsmen reversed their stoke (*naves actuaria*). Many had a deck-flooring to carry the military engines though they were equally useful for transporting horses or supplies" (*Tac.Ann.* 2.6). Although he points out that it is an assumption, Grainge (2002, 45-51) considers that the transports used in the invasion of AD 43 were similar in design and carrying capacity to the vessels used in Caesar's second expedition, and those built for Germanicus. He estimates that some 60 infantrymen, or 10 cavalrymen and their horses could be carried on each ship. This would give a requirement of 833 transports, and Peddie (1997, 40-10) arrives at a similar figure. Salway (1993, 61-2) assumes that the whole invasion task force sailed at the same time, "to make opposition to the landing less easy" and that "one section of the Roman army almost certainly made its base at Richborough...... another probably landed near Chichester.....the position of the third landing is quite unknown". However, the statement by Dio Cassius (15, 19) that the expedition "sailed in three divisions" might equally apply to a single landing place, but with a first wave carrying out the initial landing, a second wave securing the beachhead and the final wave providing reinforcements for the breakout into the neighbouring countryside. Whatever may be the case, it is certain that a large number of vessels would be available on this side of the Channel for future operations, both in the initial conquest and for further operations on the coasts of Britain. In Chapter 6, it will be suggested that some were later employed in campaigns on the coasts of Wales.

In Chapter 3 it was commented that, in the study area, a Roman skipper was, largely, dependent not on the sailing characteristics of his vessel or the competence of his crew, but on the prevailing weather and tidal conditions. However, when operating in direct support of the military, there would be occasions when maximum operating speed, and therefore minimum passage time, would be the prime consideration. Marsden (1994, 197-8) has suggested a theoretical maximum speed of between seven and nine knots for the early 2nd century AD Blackfriars ship excavated in London (see Chapter 3). Grainge, an experienced amateur sailor, considers that in acceptable conditions of wind and weather, this type of vessel was unlikely to have achieved anything like this speed. Operating in the equivalent of a Beaufort

Scale Force 4, he considers that the maximum speed on a beam reach (a sailing vessel's position of maximum performance) would have been five knots, and that downwind it would have been even slower, of the order of three to four knots (2001, 53-4). As the "the speed of the convoy is the speed of the slowest ship" it is reasonable to assume that, when sailing in company, this would be the average speed attained.

Later British military fleets

In Britain, the concept of a fleet under the control of the army was not confined to the Romano-British period, as from the Tudor period until the recent past the military were in control of some form of naval activity. This offers some interesting comparisons with the Roman period as, until the Second World War, the "owned" vessels were crewed by civilians, with at other times reliance been placed on ships being requisitioned civilian sources.

Under Henry VIII, vessels engaged in the transport of military stores and cargoes were administered by the Office of Ordnance, headed by a General and based at the Tower of London, which also served as the Royal Arsenal at that time (Habesch 2001, 1-8). However, a Royal Commission in 1597 found that, "corrupt and fraudulent practices had become rife", and the Office was replaced by the new body entitled the Board of Ordnance. For the first 150 years, chartered vessels were employed by the Board, and the early surviving record of ship-owning activity is of repairs to a boat built in 1746. Because of general mismanagement and incompetence during the campaigns of the Crimean War of 1854-5, the Board of Ordnance was dissolved, its fleet, however, survived under a new name, the War Department Fleet. The Army Service Corps was founded in 1888, with a responsibility for supply and transport, including the War Department Fleet. A classic example of the use of rivers for the movement of large bodies of troops was provided by the Sudan campaign of 1896-8. Following a failed land-based attempt to relieve General Gordon at Khartoum, large numbers of river vessels, including all of Thomas Cook's Nile steamers, were used to ferry an Anglo-Egyptian Army in a punitive expedition that ended in the defeat of the Dervish army at Omdurman (*ibid.* 2001, 13-24).

In 1916, it was decided to introduce a cross-channel service operated by vessels of the Royal Engineers and, perhaps ironically to any student of Romano-British history, a military port and depot was established at Richborough. By 1918, this had become a major seaport capable of handling 30,000 tons of cargo per week, with over 200 barges crossing the Channel to French ports (*ibid.* 24). In the war against Turkey, the scarcity of roads and railways meant that water transport on the great rivers of the Tigris and Euphrates was the only practical means of moving large bodies of men and supplies, during the campaigns to capture Baghdad. To a lesser extent, the Western Front was served by inland water transport, as shown in Figure 5.6, in a manner recalling the campaigns of Tiberius in the early 1st century AD, with vessels of a similar size, albeit with more modern methods of towage!

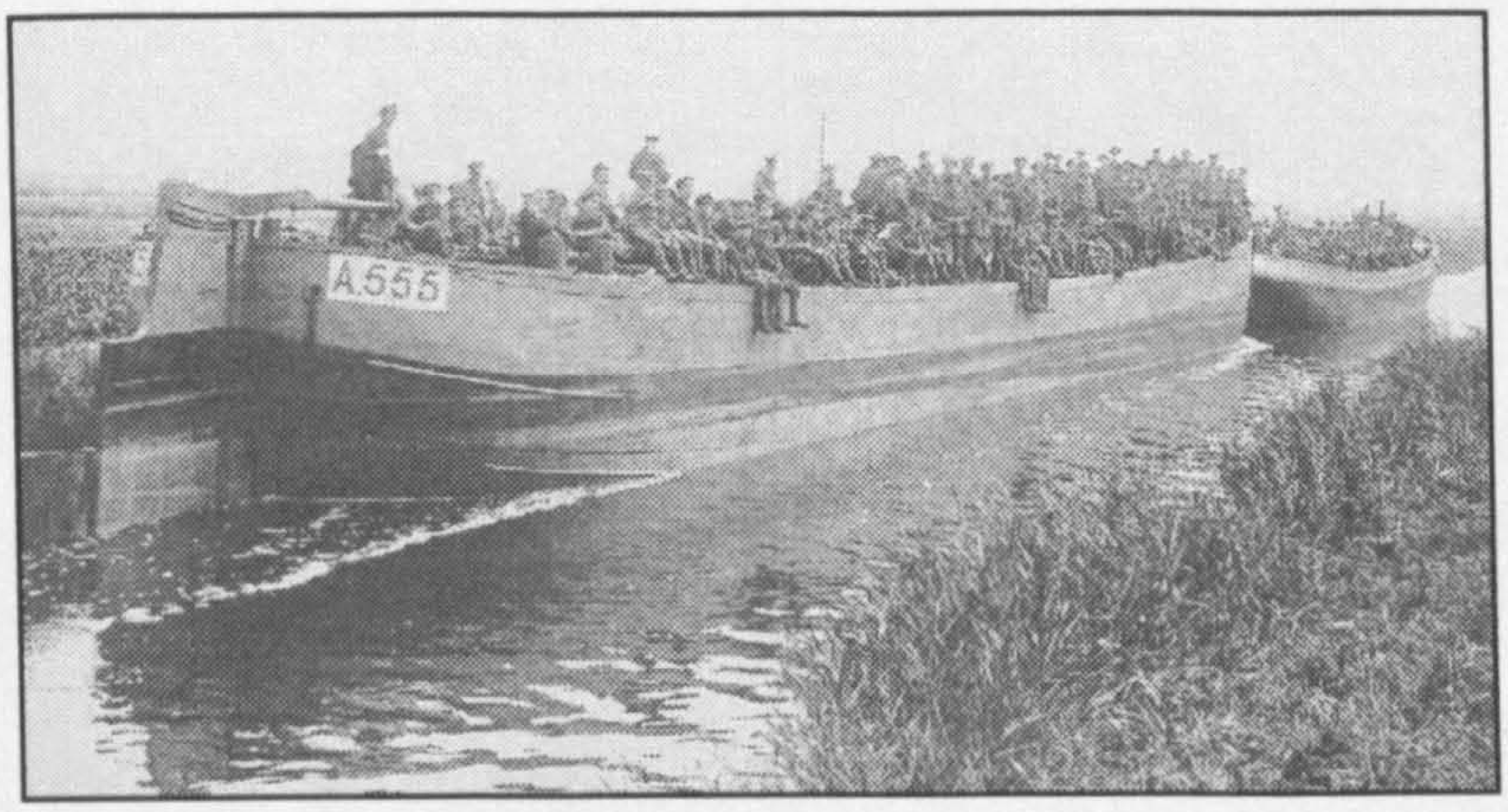


Figure 5.6. Troops being transported by barge on the Furnes-Dunkerque canal during August 1917. Museum of Army Transport, Beverley

The Royal Fleet Auxilliary (again a civilian manned operation) was constituted in 1905 and began by carrying coalbunkers and other stores, acquiring a tanker fleet as British warships became oil burning during World War I. The RFA saw service in every naval theatre of operations (from the Arctic to the Pacific) in the Second World War, including the Maltese, Russian and other convoys. During the Falklands Conflict in 1982, the RFA spearheaded logistic support for the Task Force, losing *RFA Sir Galahad*, with heavy casualties, to Argentinean air attack at Fitzroy (2003, www.mod.rfa.uk).

Conclusion

Milne has described the *Classis Britannica* as "very much a Romano-British institution, rather than just another Roman fleet", operating in a different manner to the fleets at Misenum and Ravenna (Milne 2000, 130), and to these might be added the *Classis Germanica* and other (mainly) river based fleets such as those of *Moesia* and *Pannonica*. Throughout their histories, these fleets were actively concerned with the protection of the frontiers based on the Rhine and the Danube, and as such, their function was "naval" in the true sense of the word, rather than the cross-Channel transport of supplies, provisions and personnel, that became the major role of the *Classis Britannica* in the post-Conquest period. However, in the conquest and consolidation phase, an important early role was close support of the army, probably under the direct command of the local military commander; it is suggested that there is some evidence that this capability may have played a part in determining the strategy for the conquest of the western and northern areas of Wales.

It will have been observed that only brief reference has been made to the river-craft known to have operated on the rivers of the Northern Provinces. There is significant archaeological evidence, for example the vessels excavated at Mainz, Zwammerdam, Oberstim, and considerable epigraphic evidence, such as the many portrayals of ships on Trajan's Column. Whilst, in themselves, extremely interesting to the student of maritime archaeology, it is the writer's opinion that these types of craft are unlikely to have played a significant role on the waterways of Britain. Warships similar to the Mainz vessels were designed for the defence of a river frontier such as the Rhine or the Danube, and this role was never needed in *Britannia.* The cargo-carrying craft such as those at Zwammerdam (up to 35 metres in length) were designed to operate on European rivers (McGrail 2001, 201-7), and were much larger than those usable on British rivers. It is only necessary today to observe the size and quantity of barges presently operating on these rivers, and compare them with those still in use on the rivers of Britain, to note a much later parallel.

It has been shown that there were periodic large-scale movements across the Channel, and that these were in addition to the routine tasks of the inter-provincial supply of food and materials, and the ferrying soldiers to and from duties in the Province. This lends support to Milne's opinion that "the fleet may well have worked both for the Provincial governor, as was to be expected, but also for the Procuratorial office" (2000, 127-31). He suggests that pre-Roman Britain had no indigenous fleet, and that it was therefore necessary for the *Classis Britannica* to undertake this task, further suggesting that the fleet may have also been involved in the construction of the wooden quays at London (see Chapter 6), and the transport of stone for the city's walls. Though there is no direct evidence for this hypothesis, it would result in an effective division of responsibility between the Governor and the Procurator.

Chapter 6. Naval/military operations in the west of Britain

Introduction

Naval power fulfilled an important role, during the initial period of military conquest and consolidation. Tacitus (*Ag*.25) describes how, during the course of combined operations, the soldiers of the army and the sailors of the fleet often met together in camp, and "matched the perilous depths of woods and ravines against the hazards of storms and waves, victories on land against the conquest of the ocean". Referring to Agricola's campaigns in Scotland, Tacitus states that "The war was pushed forward simultaneously by land and sea, the infantry, cavalry and marines often meeting in the same camps", with the fleet being sent ahead "to plunder at various points and thus spread uncertainty and terror". The role of the fleet in reconnaissance is also indicated when Tacitus states that Agricola "used his fleet to reconnoitre the harbours" and that "The coast of the remotest sea was first rounded at this time by a Roman fleet which first established the fact that Britain was an island. At the same time it discovered and subdued the Orkney Islands, hitherto unknown" (*Ag*. 10). Appian also comments on the role of reconnaissance when he states that it "was carried out on land by the cavalry and at sea by liburnians" (*Hist*. 5. 103).

The conquest of Britain was achieved by military, not naval victories, and whilst operating over extended lines of communication, particularly in the Highland Zones. The role of the fleet, in enabling the safe provision of supplies and equipment to the armies in the field was therefore of major importance; the logistics of military supply have been previously discussed in Chapter 4.

It is not intended to discuss the naval operations of the Claudian invasion of AD 43, other than in passing, as this topic has been the subject of much academic debate elsewhere (e.g. Cunliffe 1968, 255-72; Peddie 1987; Hind 1989, 1-21; Black 1998, 306-7; Frere & Fulford 2001, 45-55; Manley 2002, Grainge 2002). Likewise, there is an extensive literature on *Dubris*, the *Classis Britannica* fort at Dover (Philp 1981), other Saxon Shore forts (e.g. Johnson 1977; Maxfield 1989) and the involvement of the Fleet in the iron industry on the Weald (Cleere & Crossley 1985) and these topics, although important, are not discussed. However, military operations in the study area are described in general terms, in order to form a platform for the consideration of probable waterborne operations.

Invasion and conquest

Cross-channel trade from Roman Gaul had taken place for almost 100 years when the Claudian fleet under Aulus Plautius invaded Britain in AD 43, and therefore there were pilots who knew of the southern rivers and estuaries, and who were familiar with the tidal conditions. For example, Diodorus Siculus (V, 22) comments that "A strange thing occurs around the nearby islands between Britain and Europe, for at high tide the causeways between them and the mainland are covered and they seem to be islands, but at low tide the sea recedes and leaves a large area high and dry so that they look like peninsulas".

It is generally accepted that the invasion force of AD 43, whether it landed at Richborough, Chichester Harbour or both (see below), comprised four legions, fourty regiments of auxiliary infantry and cavalry, together with animal handlers and transport workers; a total of some 40,000 troops. The problems of supply for the soldiers, cavalry horses and probably some 10,000 transport animals would have been very significant. It is sometimes suggested that the Roman Army "lived off the land", but this is clearly unrealistic. Firstly, the territory through which they would have passed would have been capable of only supporting the resident population, and the requirements of an army of some 40,000 soldiers were clearly unobtainable. Secondly, the British tribes would have emptied their granaries, and taken their herds of animals with them as they retreated, thus denying them to the advancing Romans.

The invasion fleet comprised some 1,000 vessels and, after the initial landings, some of these would have been used to supply the army by sea, as it advanced northwards to the Catuvellaunian capital of Colchester, later to support the campaign of Vespasian along the South Coast. A six-month's supply of grain for a Roman army of 40,000 soldiers weighed some 6250 tons, and could have been transported in approximately one hundred 60-ton shiploads. A supply fleet did not need to transport all the provisions for the entire campaign at once, as ships could make several round-trips in order to meet the demand, and therefore the speed of vessels is as important as their capacity in logistical planning. Casson (1951, 140-3) suggests that the average speed of a merchant ship could be as low as 2 knots, but considers that this speed could be substantially increased if circumstances were favourable. Using Casson's average figure, six month's grain for 40,000 men, could have been transported across the English Channel by thirty-five 60-ton ships, each making three round-trips over a 120-day period.

Peddie (1987, 98-9) suggests that Roman military thinking would have been influenced during the advance towards the Thames, by the fact that at least three rivers were navigable for considerable distances. The Lea was negotiable as far as Ware, and thence via the tributary Rib, as far as Braughing; the Roding was navigable to Chigwell and probably to Ongar; the Chelmer was open to Chelmsford and perhaps to Great Dunmow. Interestingly, he also comments on an opportunity to use the Mardyke, "although its appearance today belies the possibility", pointing out that the river was used by shallow-draught vessels as late as 1870.

<u>*The conquest of the South West Peninsula*</u>

The future Emperor Vespasian, commanding a battle group headed by the 2nd Legion advanced along the south coast and, according to Suetonius (*Vesp.* 4), fought forty engagements, subdued two tribes, took twenty strongholds, and captured the Isle of Wight. Martin (1992, 4) has suggested that the maintenance of extended land-based lines of communication (see below) would have been detrimental to his advance, in terms of both speed and consumption of manpower, and points out that there is no archaeological evidence to support this strategy. There is, however, evidence that coastal supply bases at Fishbourne and Hamworthy supported Vespasian's advance into the West Country and the presence of pre-Flavian pottery, and a well-chosen position, suggested to Fulford (1968, 256) that Topsham, on the Exe estuary, also fulfilled this function. Recent excavation appears to have confirmed the existence of a fort/supply base (*Britannia* 32, 370).

There is only limited evidence for military operations in the territory of the Dobunni, whose territory was probably the area of present day Gloucestershire, Herefordshire, Worcestershire and north Somerset, and it is possible that the tribe was actively pro-Roman.

The southwest peninsula was occupied by the tribe of the Dumnonii, and in a Presidential Address to the Devonshire Association in 1891, R.N. Worth commented that they were "a race numerous and skilful, civilised, well capable in numbers and in natural resources of self-defence, habituated to strangers, profiting by commerce. <u>That race was never conquered [by the Romans]</u> ....There would be an acknowledgement of [Roman] suzerainty - little more than nominal; a certain rendering of tribute..... the periodic visit of a Roman trader - a welcome guest - or his constant presence in some favoured locality" (present writer's emphasis). It is interesting to note that a similar view has also been held regarding the tribe of the Demetae in southwest Wales, and a contrary opinion will be suggested later in this chapter. At the 1969 Roman Frontier Studies Conference, Aileen Fox commented that, "For a long time it has been generally believed that the south-western peninsula was neither conquered or occupied by the Roman army" (1974, 84) and then proceeded to present her recent evidence to the contrary.

Archaeological investigation has now revealed the presence of many forts in Somerset and Devon (e.g. Wiveliscombe, Cudmore Farm, Tiverton, Cullompton, Hembury, Gittisham, Killerton, Bury Barton, North Tawton, Okehampton, Stoke Hill, Ide, Clayhanger, Lapford) and more recently at Rainsbury (Riley & Wilson North 2001, 77-9). Finds of 1st century military character are known from the Mountbatten area of Plymouth Sound (Bidwell & Silvester 1988, 43-6), and it would be surprising if a fort were not established at this sheltered coastal location. A fort in the Barnstaple area, on the Taw/Torridge estuary is probable, but this has not yet been found, although a possible fortlet is suggested at Newton Tracey (Griffith 1984a, 19). Only one fort has been found in Cornwall, and the apparent absence of roads in the county suggests a dependence on coastal se-routes. Bearing in mind the evidence from other areas, e.g. the Mendips, North Wales, and Derbyshire, why we have not found evidence for military exploitation (other than limited evidence from Nantstallon) of the mineral resources of Devon and Cornwall is a problem in search of a solution.

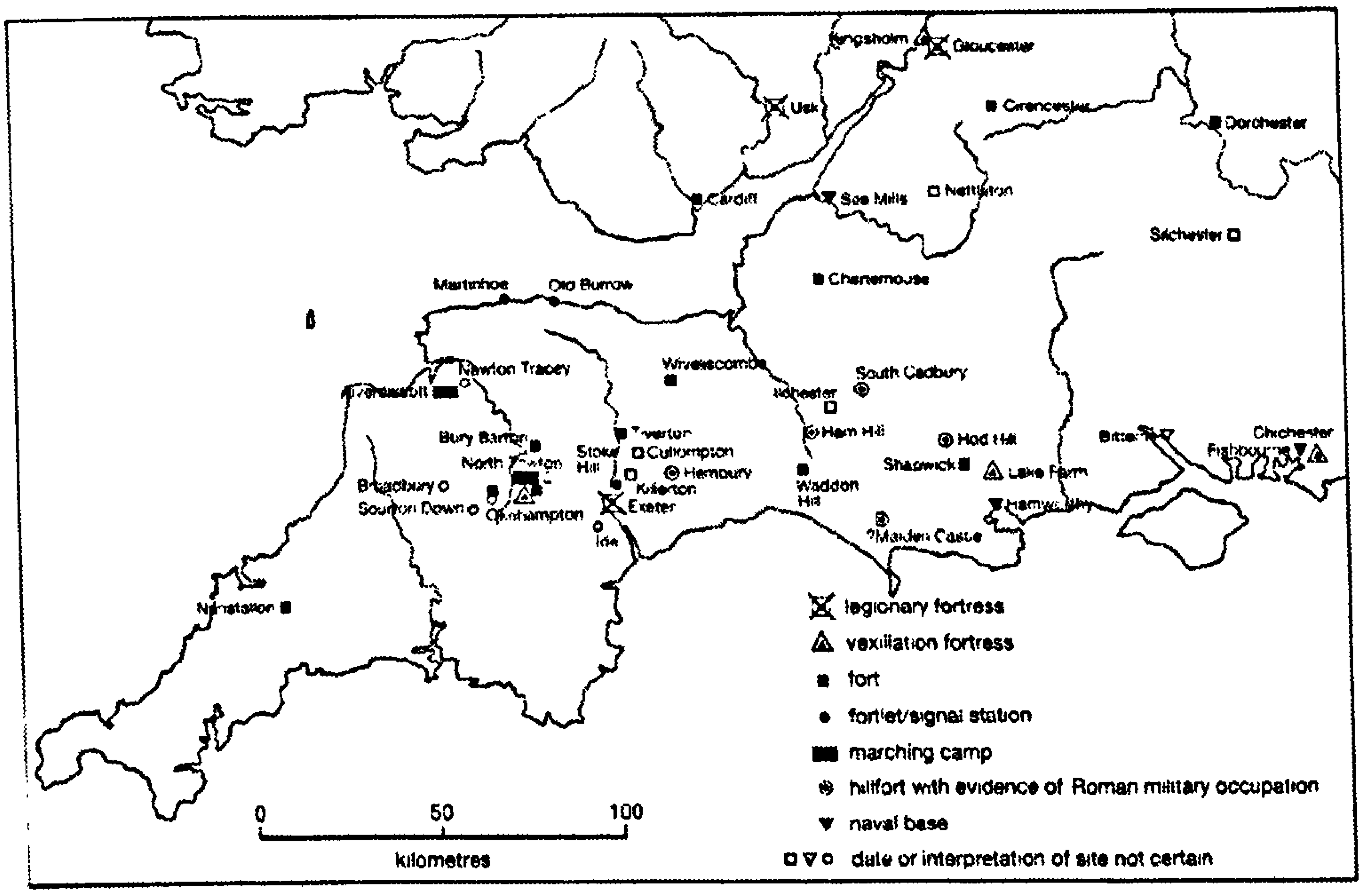


Figure 6.1. Pre-Flavian (AD69) military activity in the South-West. (Jones & Mattingly)

The presence for several decades of a considerable force in Dumnonian territory, suggests that the tribe resisted conquest and that, in the consolidation period, a network of forts was required to impose control. There is little evidence to indicate whether the conquest of the southwest peninsula was achieved during the course of a rapid campaign, or by successive advances over the years.

<u>*The conquest of Wales*</u>

There is no reliable documentary evidence available for the study area, and any attempt to reconstruct the history from that period must rely on archaeology alone. Marching (or temporary) camps are the primary indicators of Roman offensive operations but, when compared with northern England and Scotland, only a small number (*Figure 6.3*) have been found in Wales and the Marches (Davies 2000, 5-7). It will be later argued that this paucity of sites, particularly in west and north Wales, may be the result of the conquest of that area having been achieved by amphibious operations, rather than by cross-country penetration over difficult terrain. Typology is of little help in identifying specific campaigns, as camps with *tituli* (an exterior bank and ditch protecting a gate) or *claviculae* (an internal arc of the rampart), earlier considered diagnostic of period, appear to be equally early. Morphology is equally of little assistance as camps thought to belong to the same series, such as Whittington in Shropshire and Penrhos in Denbighshire differ in shape (*ibid.*). Whilst it is not possible to assign camps to specific events, there does seem to be an indication of a strategy designed to drive a wedge between the Silures in the south and the Ordovices in the north, and Jones &

Mattingly (1990, 79-81) have produced a map (below) illustrating the possible early campaign routes (*Figure 6.2)*

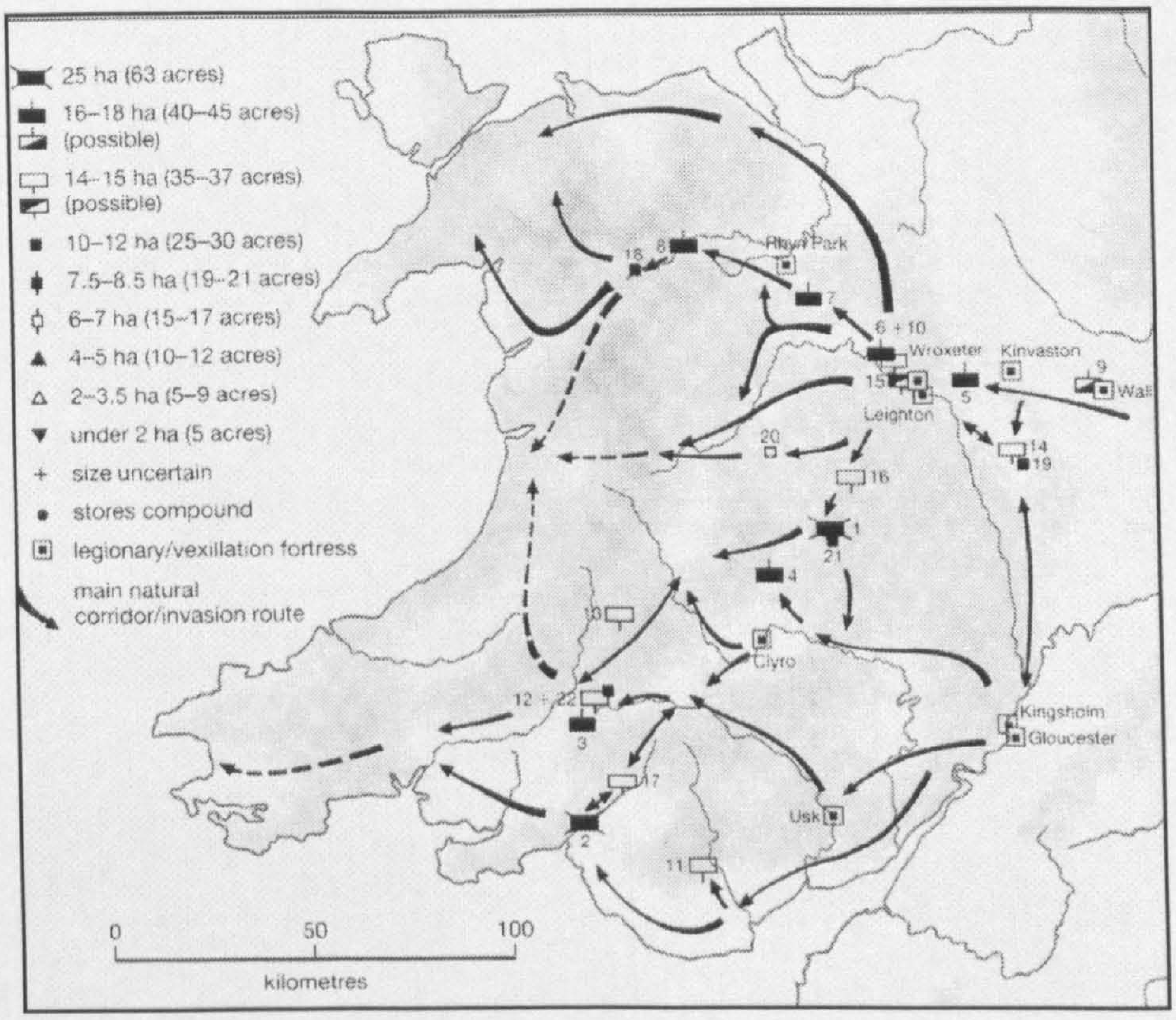


Figure 6.2. Possible early invasion routes determined by the location of marching camps. Note apparent absence of camps in the west and north. (Jones & Mattingly)

Jarrett (1994, 20) commented that the system of pre-Flavian forts in Wales looks like "a half-finished project" and this is probably the case, as the final conquest was delayed by some 15 years because of firstly, the need to cope with the Boudiccan revolt in AD 60 and, secondly, more pressing problems in northern England. The concept of Wales as a political entity had no significance in Roman times, and military campaigns were therefore directed against individual tribes within the area. Some evidence of Flavian or pre-Flavian occupation is indicated at the forts at Cardiff, Usk, Llandovery, Clyro, Wroxeter, Leintwardine, Whitchurch, and at Caersws 1. The distribution of forts appears to indicate the occupation in strength of the territory of the Silures, Cornovii and Ordovices, and it has been suggested that these tribes were anti-Roman, while others, such as the Demetae and the Deceangli have been considered as probably prepared to co-operate with the invaders (e.g. Frere 1978, 70: Jarrett 1969, 23-6; Wacher 1975, 390). However, a 1.75 ha. auxiliary fort, probably founded during the campaigns of Sextus Julius Frontinus in AD 75, has been identified at Carmarthen (James 1992, 8-14), and a road running westward for 40 km from the fort, in the direction of Milford Haven and St David's, is now known (Driver 2002, 61-1). This probably led to a fort, or forts in Pembrokeshire (Davies 2000, 15), and this suggestion receives some indirect support from the evidence of ships from Caerleon visiting that area (Boon 1978, 24-36). Most recently, a large fort has been recorded, during a geophysical survey at Dinefwr Park, Llandeilo. Covering an area of some 4 hectares, the fort was originally constructed in the mid-70s AD, with a smaller fort being built at some later date (Hughes 2003, 144-7; British Archaeology, September 2003). This new evidence must cast doubt on whether the Demetae submitted to conquest without some form of resistance.

Consequent upon the visit of Hadrian and the decision to construct a permanent Northern Frontier, there was a change of emphasis in the role of the legionary fortresses at Caerleon and Chester. Both legions were involved in the building of Hadrian's Wall and the Antonine Wall and, during the building season, the fortresses probably held only minimal garrisons. The switch from offensive deployment in the pre-Flavian period to the establishment of a policing garrison meant that security became the responsibility of the auxiliary units. The success of the policy of pacification is demonstrated by the scale of reduction in the size of the garrison achieved by the mid-second century. Major reductions in the Welsh garrisons began under A. Platorius Nepos, governor from AD 122 to 125, and his addition of garrison forts to Hadrian's Wall would certainly have required the redeployment of considerable numbers of troops. Many of the Welsh forts were de-commissioned, and by the end of the Hadrianatic period in AD 138, it is probable that only Castle Collen, Neath, Caernarvon, Brecon y Gaer, Caersws and Forden Gaer were still garrisoned. This pattern probably remained until the 4th century with only the addition of the Saxon Shore type fort at Cardiff, a small fort/harbour at Caer Gybi (Jarrett 1969, 135-37) and a signal station, on Anglesey.

The Classis Britannica in the Bristol Channel?

The presence of the *Classis Britannica* in the Bristol Channel was given credence in the 1930's, by the discovery of an inscription (*Roman Inscriptions of Britain* 2448.3) on the temple mosaic at Lydney, naming T. Flavius Senilis, as *pr rel.* This was expanded by Mommsen to *pr(aepositus) rel(iquationi classis)* and interpreted as "officer-in-charge of a fleet supply depot" (Wheeler 1932, 103). Given the religious context of the site, the present view is that its most satisfactory rendition is *pr(aepositus) rel(igionis)*, "director of the cult" (de la Bédoyère 1999, 144). Fulford (1996, 26-7) accepts this, but has argued that the dedication to the god Nodens by Flavius Blandinus, an *armatura* (weapon instructor), is an indication of a military unit at the site. He sees Wheeler's "Guest House" as the *principia* and the *abaton* as officers' accommodation. The construction of the temple complex is unlikely to have commenced before the late 3rd/early 4th century, and Fulford's argument seems highly unlikely, as there is no known example of a similar military layout or, at that period, any evidence for new military construction, other than the very different Saxon Shore forts. Dedications at temples by military personnel are commonly found, and are not necessarily evidence of an adjacent military site and in any event, Lydney is not well strategically located as a supply depot (to supply what and to where?). It is suggested that the naval units operating in the area were integrated into the military command, and this is the subject of further discussion below.

Early naval operations in the Bristol Channel and the Irish Sea

In discussing Roman campaigns in North Britain, Martin (1992, 1-2) has suggested that Agricola's ability to operate successfully far beyond his northernmost supply bases suggests a "synchronised supply service by sea" and that, when the fleet was sent ahead of the main army, one of the purposes may have been to set up advanced replenishment depots. These would be held for them "as long as it was necessary to support a mobile task force.............operating without the encumbrance of heavy impedimenta". Because size of baggage trains, and in particular the need to provide fodder for the draught and pack animals, it will be obvious that this was a very desirable objective for operations in the study area.

The presence of strong Roman naval forces in the Irish Sea is suggested by Tacitus when he states that Agricola "drew up his forces along that part of Britain which faces Ireland, not in fear but in hope..........Its approaches and harbours are tolerably well known from our merchants who trade there". Tacitus goes on to comment that he had "often heard Agricola say that Ireland could be conquered and garrisoned with a single legion and few auxiliary troops" (*Ag.* 24). Ptolemy's map of Ireland shares the cartographic errors of some of his other works, e.g. the 90 degree "skewing" of Scotland, but does at least indicate a Roman knowledge of the coasts, rivers and settlements of the island, and artefacts demonstrating established trading links during the Romano-British period have been recorded (e.g. Harbison 1989, 173-84; Warner 1991, 112-7). The recent discovery of a possible Roman fort at Drumanagh, 23 km miles north of Dublin, has led to suggestions that the Romans may have invaded Ireland after all. The heavily-defended, 20 hectare coastal site has produced 1st and 2nd century Roman coins, but its significance is disputed. Some claim it may have been a Roman bridgehead, used as a base for military campaigns inland, whereas others argue the site was simply a native Celtic settlement with evidence for trade with Roman Britain (*British Archaeology*, No.12, 1996).

Signal stations on the Bristol Channel coast?

Old Burrow and Martinhoe

In the Bristol Channel, a fortlet at a height of 333 m at Old Burrow on the North Devon cliffs was established soon after the conquest of the West Country, a small quantity of Claudian pottery and coins (a *denarius* of Tiberius and an *as* of Claudius) indicating a foundation of c. AD 48-54. A square inner enclosure, 25 m across, surrounded by a ditch, and probably with a timber gate-tower, was situated within a sub-circular rampart 80-90m diameter, within an external ditch 8-11m wide. The entrance to the outer enclosure was on the seaward side, and that to the inner on the landward side, so that, to reach the inner gate, potential attackers would have had to make a half-circuit of the defences under fire from the inner rampart. No remains of timber barracks were found; with some scattered post-holes (75-100 mm in diameter) suggesting tented accommodation for a century of auxiliaries (Fox & Ravenhill 1965, 253-8).

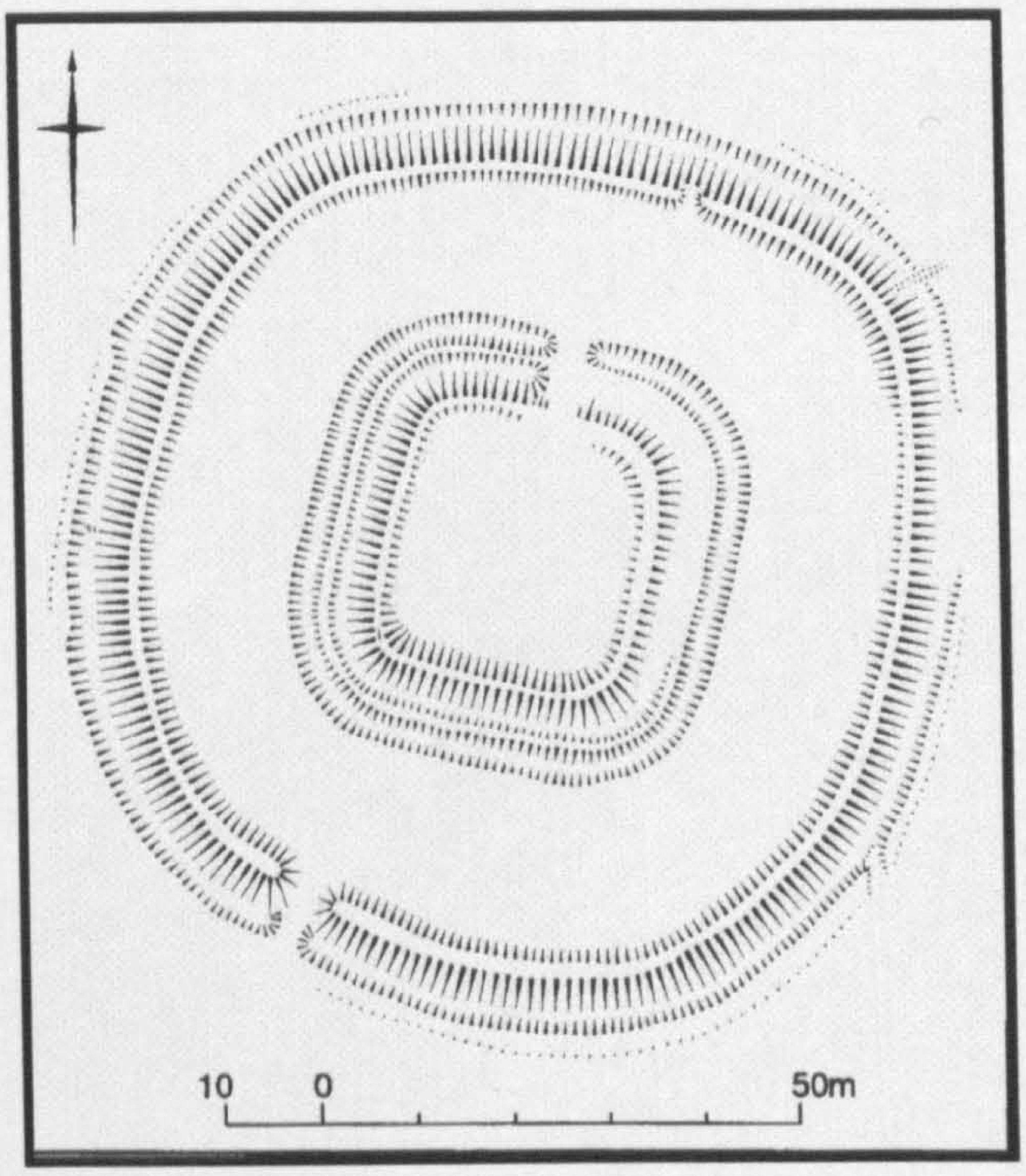
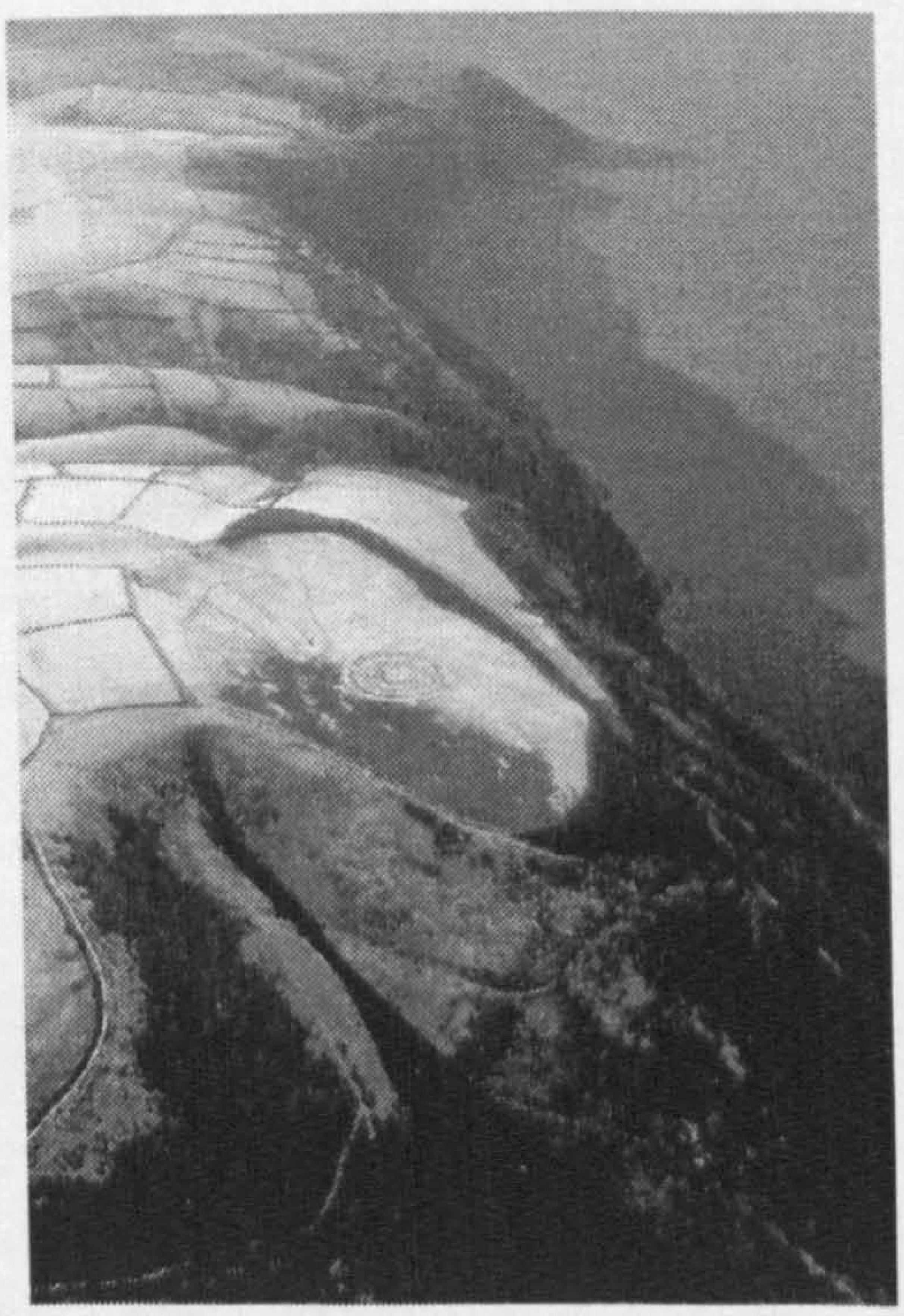


Figure 6.3. Plan of fortlet at Old Burrow – (English Heritage)

Some 15 km to the west, and at a height of 240 m, the fortlet at Martinhoe is of similar size and layout, but here the inner enclosure contained three timber buildings; a pair of barracks on the east and west, and a small rectangular building on the south side. It has been suggested that the outer enclosure has remains of signal fires. Neronian bronze coins and Samian ware, including a sherd bearing the stamp of Licinius (AD 46-65), led the excavators to suggest that the site had been occupied on a semi-permanent basis for about 10 to 20 years within the period 55-75 AD (*ibid.*).

Both sites command extensive views of the Bristol Channel, but are not inter-visible, and inland the outlook is limited to the northern slopes of Exmoor, rising to 500 m some 10 km distant. Fox and Ravenhill concluded that these posts were probably intended to observe hostile naval action in the Bristol Channel, and suggested that one fortlet succeeded the other, with Old Burrow being established c. AD 48 and then being succeeded by Martinhoe about AD 60, and evacuated in c. AD 78 on the final subjugation of the Silures.

However, Symonds (in Wilson 2002, 96) has pointed out the identical and unusual layout of the earthworks, suggesting that that they are contemporary, but also that the limited pottery finds are not susceptible to such close dating. He suggests that they were intended to operate as a pair, each being responsible for a different part of the coastline. Clearly, the comment on the dating of the pottery is correct, but surely, there is unlikely to have been a significant change in construction methods in a period of only some 10 years. Perhaps more importantly, as both fortlets are suggested as being garrisoned by a century, the detachment of a third of a complete regiment for this task is considered improbable.



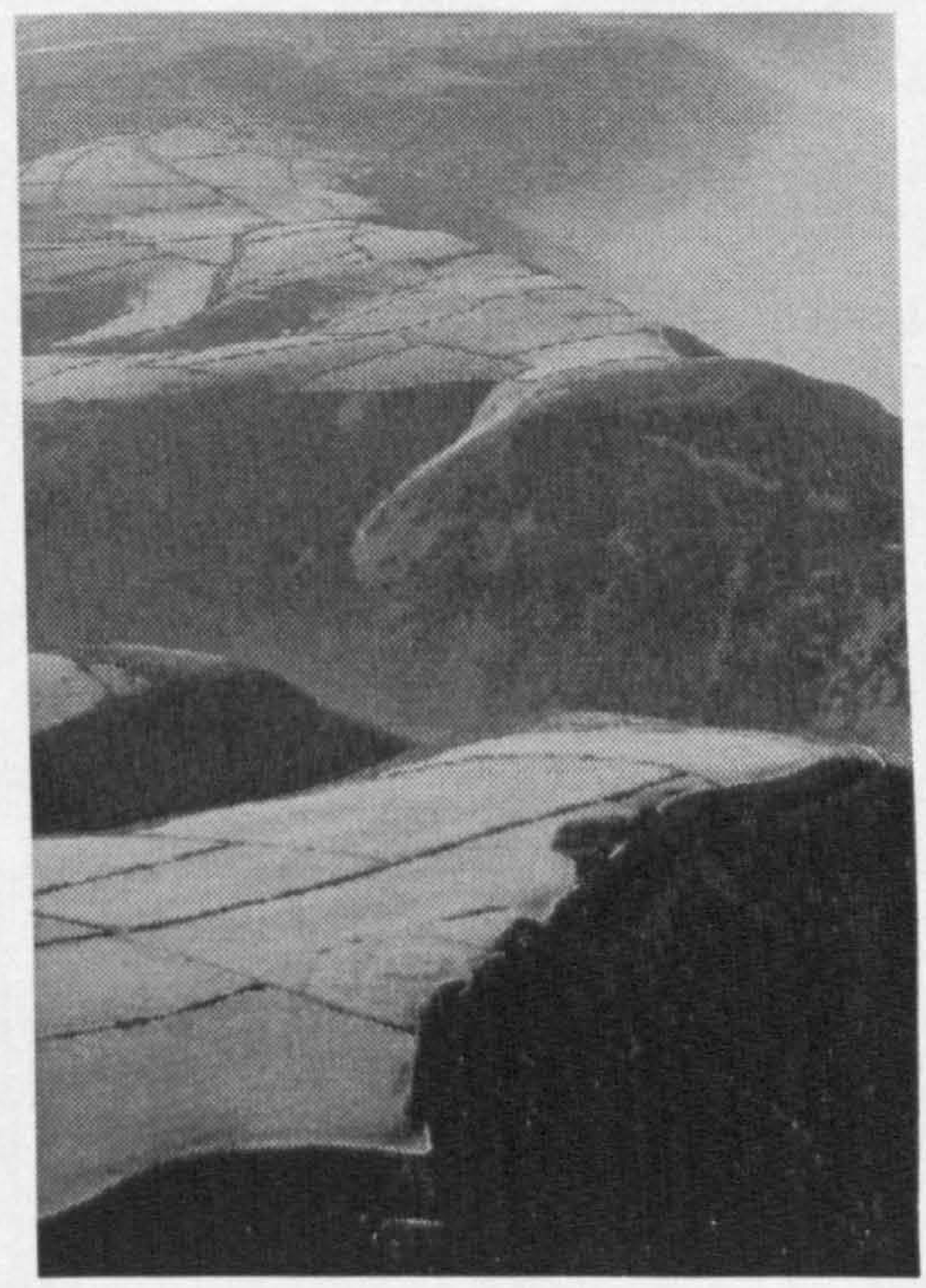
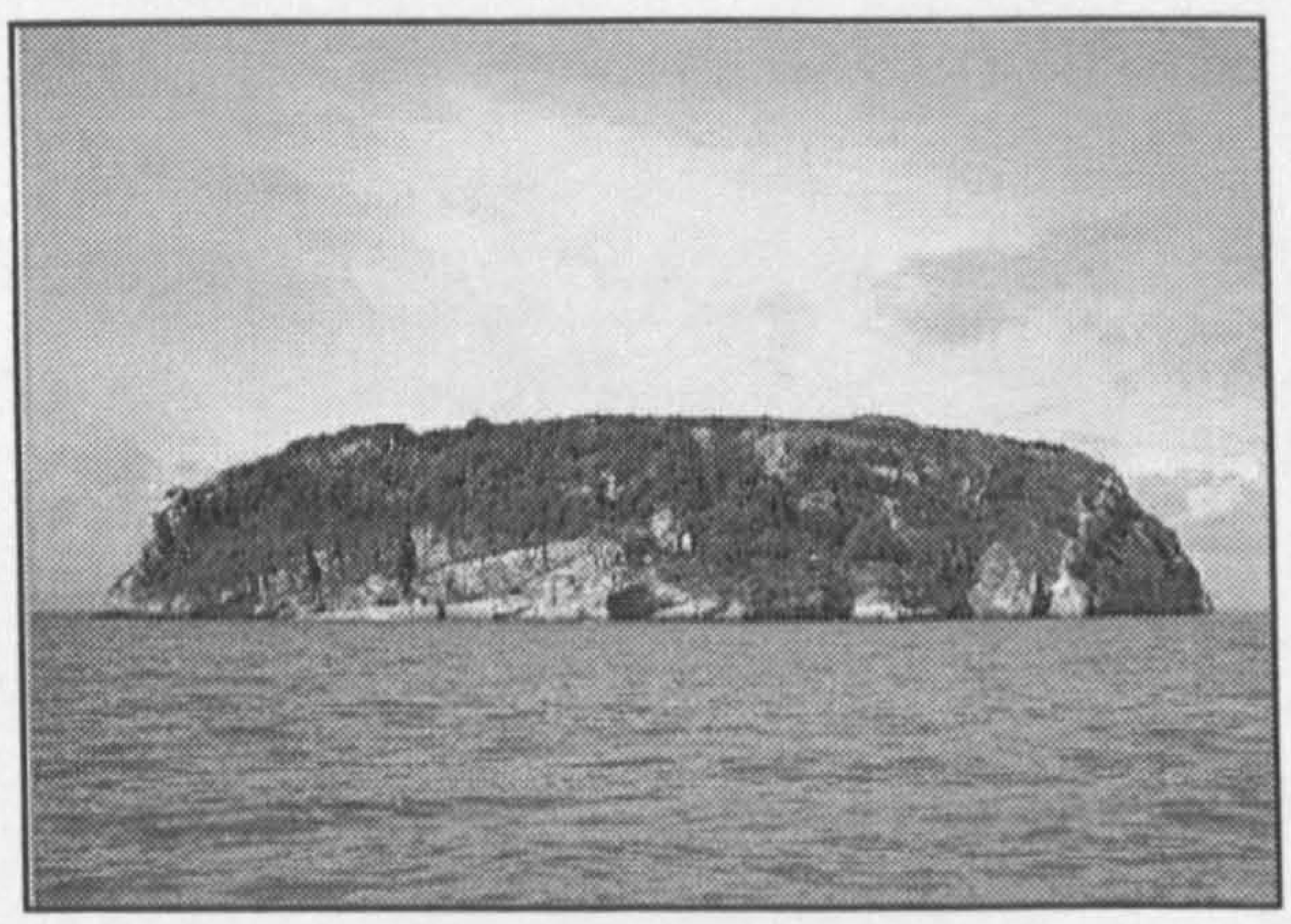


Figure 6.4. Left - Fortlet at Old Burrow - see plan above
Right - Fortlet at Martinhoe – note erosion of outer rampart
(English Heritage)

The assumption that these posts were intended to give early warning of any seaborne movement of hostile forces, has led to the conclusion Silurians had vessels capable of carrying troops in sufficient quantity to pose a threat to the Roman occupied area. Peddie comments, "It may not be over imaginative to suggest that the Silures possessed a sea-going capacity which posed more than a casual threat across the Bristol Channel. Their ability to land on the opposing coastline would have made considerable demands upon Roman military resources and, until the arrival of naval vessels to establish complete control of those waters, would have inevitably delayed the course of the Roman campaigns" (1987, 128). This view is supported by Davies (2000, 12) who has suggested "the Silures were not a spent force and were still perceived as representing a maritime threat (present writer's emphasis) into the early Flavian period".

This concept fails to take into account the establishment of a 16 ha. campaign base at Cardiff in the early AD 50's (Webster 1991a, 35-9; Davies 2000, 11; Wilson 2002, 354-5), probably accompanied by naval forces based in a nearby harbour. This, together with the legionary base at Usk, indicates that, at least in the coastal areas, the Silurians had been subjugated, and that there was therefore little likelihood of enemy naval activity – even if any such threat ever existed. The conventional view of the role of both Martinhoe and Old Barrow may therefore be called into question. This possibility has reminded the writer that, from personal observation of the view from both these sites, it is difficult, other than in the very best weather conditions, to make out modern coasters making passage off Nash Point, 25 km distant on the Welsh coast, let alone small native craft, probably similar to the curraghs described in Chapter 3.

<u>*The island of Steep Holm*</u>



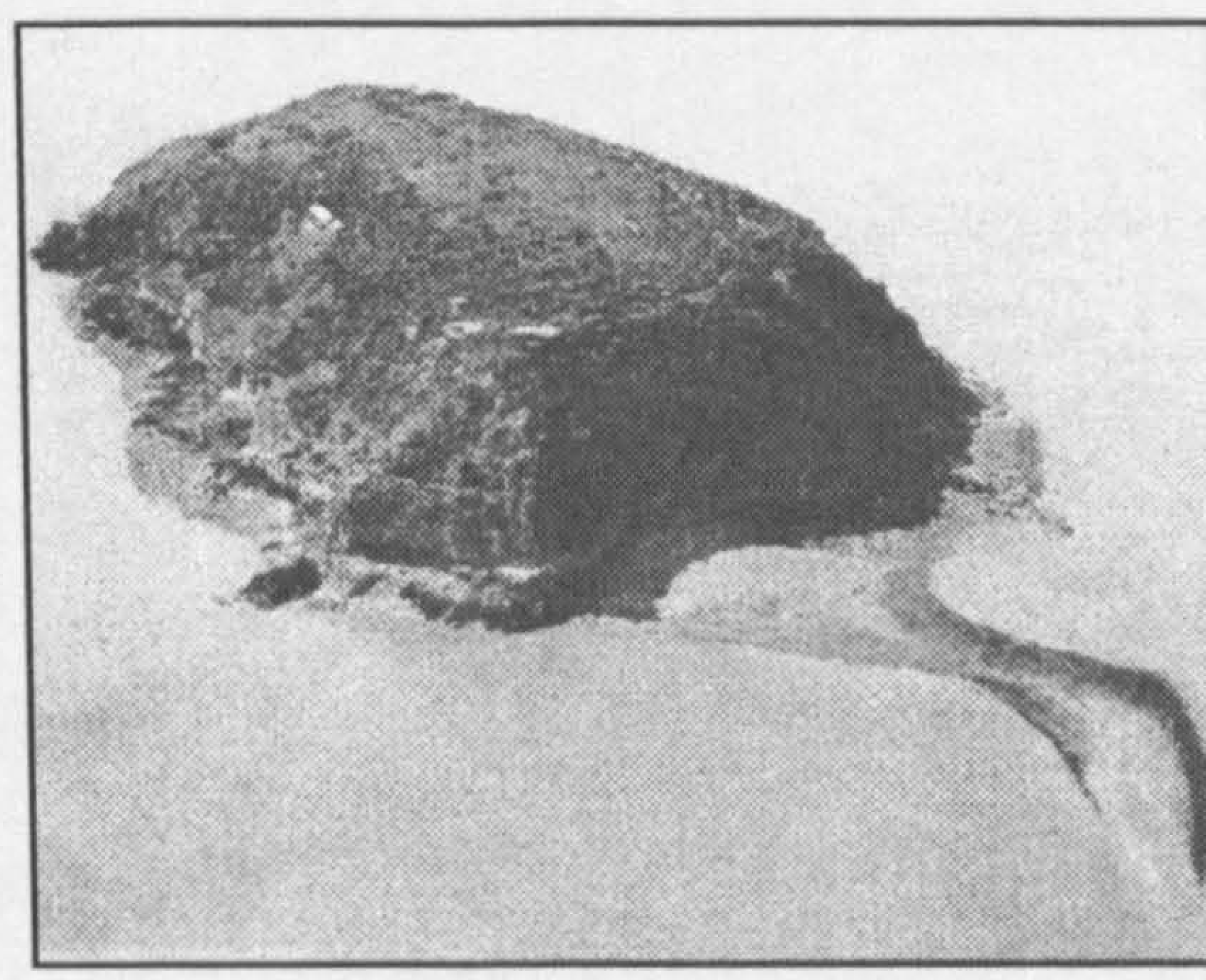


Figure 6.5. Left - approaching Steep Holm from the sea. Right - aerial view at low tide, with exposed shingle. (Kenneth Allsop Trust)

There is considerable evidence for significant Roman occupation on Steep Holm, a small island, 800m long and 300m broad, and rising to a height of 80 m above sea level in the Bristol Channel, three miles distant from Weston-super-Mare. Dating from the early 1st century AD, and therefore pre-dating the Conquest by several decades, there was a sherd of Arretine ware from a bell-shaped vessel (Dragendorf 11). Boon (1987b. 375-6) suggested that this is the most westerly occurrence of this ware, but Todd has since recorded a Form 17 from the hillfort at Hembury in Devon (1993, 17). The neck and handle of a Dressel 20 amphora is datable to between AD 90 and AD 140, Samian sherds of Form 37 type date to the 2nd century AD, and there are numerous occurrences of Black Burnished ware and fragments of *mortaria*. There are also two Iron Age La Tene III *fibulae* brooches, a type that continued in use into the 1st century, and a fragment of glass from an engraved bowl of the Winthill type, made at Cologne, Germany, in the period AD 300-350. Local records report several discoveries of Roman coins and during recent excavations, five small bronze coins, ranging in date from AD 269 to AD335, including a counterfeit of Claudius II (AD269) and a "clipped" *siliqua* of Tetricus I (AD 271-3).

This wide range of artefacts demonstrates a continuing occupation from the 1st to, at least, the 4th century AD. As the island has little economic or strategic significance (at least during the Roman period), it is difficult avoid a maritime connection. A circular structure at

Rudder Rock has been suggested as a Roman signal station (Rendell and Rendell 1993, 18-21; Rendell, S. *pers. com.* 2003). This identification is by no means certain, as the small surface area of the island has been subject to several episodes of destruction and re-construction, particularly during the installation of fortifications during both World Wars. The excavators also suggest the possibility of a second signal station at the east end of the island, covering "an expanse of the Channel and coastline not visible from the Rudder Rock area". There is, however, little reason to sail between Steep Holm and the English coast, the tidal currents are variable, large areas of sand are exposed at low tide, and passage between the island and the Welsh coast presents fewer difficulties. However, fragments of *tegulae* (roofing tiles) and *tubuli* (box-flue tiles) have been recovered from the plateau on the summit of the island, indicating a substantial building (or buildings – possibly including baths). A lighthouse, first erected in 1737, stands in this area, and it might be suggested that a single Roman observation post here, rather than at two separate locations, is a more probable alternative.

Coastal signal stations at High Cliff, St Gennys and Old Walls, Morwenstow on the North Cornish Coast (Herring 1994, 236), on cliff-tops 20 km apart, were suggested by aerial photography, with only the former being visible on the ground as a distinct earthwork (Herring, 1994, 235-7). Both these sites face due west into the Atlantic, not towards the Bristol Channel and are, in any case, at 80 km, well outside the range of visual contact with shipping on the Welsh coast. It is interesting that both lie between the identified headlands *Belerium* (Lands End) and *Herculis* (Hartland Point).

This sequence of coastal sites might suggest a chain of signal stations running along the south coast of the Bristol Channel, and then to Steep Holm from where passage could be made to Sea Mills, to the vexillation fortress at Cardiff, and to any of the fortress sites at Kingsholm, Usk, Gloucester and Caerleon. However, whilst short distance tactical signalling was used by Caesar during military actions (*BGall.* 2, 33; *BCiv.* 3, 65), Donaldson (1988, 349-56) and Southern (1990, 233-42) have convincingly argued that long distance signalling was not employed during the Roman period. Emphasising that it is not a "mere play on words", Breeze and Dobson (1972, 185-6) make a distinction between signal station, and a watch tower with a capacity for signalling. Considering a "chain" of signal stations (on Hadrian's Wall), they point out that each link needs to be positioned so as to be able to see its two neighbours, with its distance from them being decided by the maximum distance over which visual signalling is possible, in normal conditions. If this distinction is accepted, it renders the concept of a "chain" of signal on the Bristol Channel improbable.

A further problem is that many "Roman signal stations" have been identified, for example, Stoke Hill and Ide on hills overlooking Exeter (*Britannia.* 3 1972, 344-5; 16 1985, 305); Wreay Hall and Barrock Fell on the Cumberland coast (*ibid.* 4 1973, 207); and Main

Rigg to the south of Birdoswald (*ibid.* 3 1972, 308). However, some have produced only the slightest of evidence for the description signal station, for example at Carriden on the Antonine Wall this rested on traces of "tile and daub" (*ibid.* 6 1975, 226) and at Careg-y-Bwci west of the Pumpsaint/Llanio road in Dyfed, circular enclosure at "the summit of a high saddle" (*ibid.* 15 1984, 267) justified the term (in this case the reporter felt obliged to follow this with a "?"). It might be suggested that any structure, roughly 40 m x 40 m, with a good field of view, is sometimes given this attribution. In this regard, I am grateful to Steve Hartgroves, Principal Archaeologist with Cornwall County Council, for sounding a cautionary note concerning Morwenstow and St Gennys and, from observation during a recent visit, it seems unlikely that the former is a Roman signal station.

However, a possible function for Old Burrow and Martinhoe has been suggested as the observation of Roman merchant ships, not Silurian vessels, engaged in military supply during the 1st century (A.J. Parker 2002, *pers. com.*). Donaldson points out that the oft-quoted representations of "signal braziers", depicted on Trajan's Column, appear to face towards the Danube, and may more reasonably be considered as aids to navigation (1988, 356). If the coastal sites are considered as observation posts, (perhaps similar in function to the Coastguard Stations of later periods), an alternative role may be considered. For example, A Claudian *dupondius*, probably dislodged from above, was found at the base of Aust Cliff (Smith 1945, 66); this may suggest a possible observation post covering the "Old Crossing" to Sudbrook on the Welsh coast. A further possible site is at Coed-y-caerau, on a 200 m. high ridge to the east of Caerleon, where earthworks suggest a Roman fortlet. The position commands excellent views of the entrances to the Usk and the Avon, the island of Steep Holm and the "Old Crossing", and would therefore be an excellent point from which to observe movement of vessels over a wide area.

The hypothesis of a Bristol Channel chain of coastal fortlets, not fulfilling a visual signalling function, but acting as observation posts with a possible "lighthouse" capability is, at the present time, pure speculation. It is, however, considered worthy of further investigation at a later date, and is therefore included in the discussion of "Directions of future research" in the conclusion to this thesis.

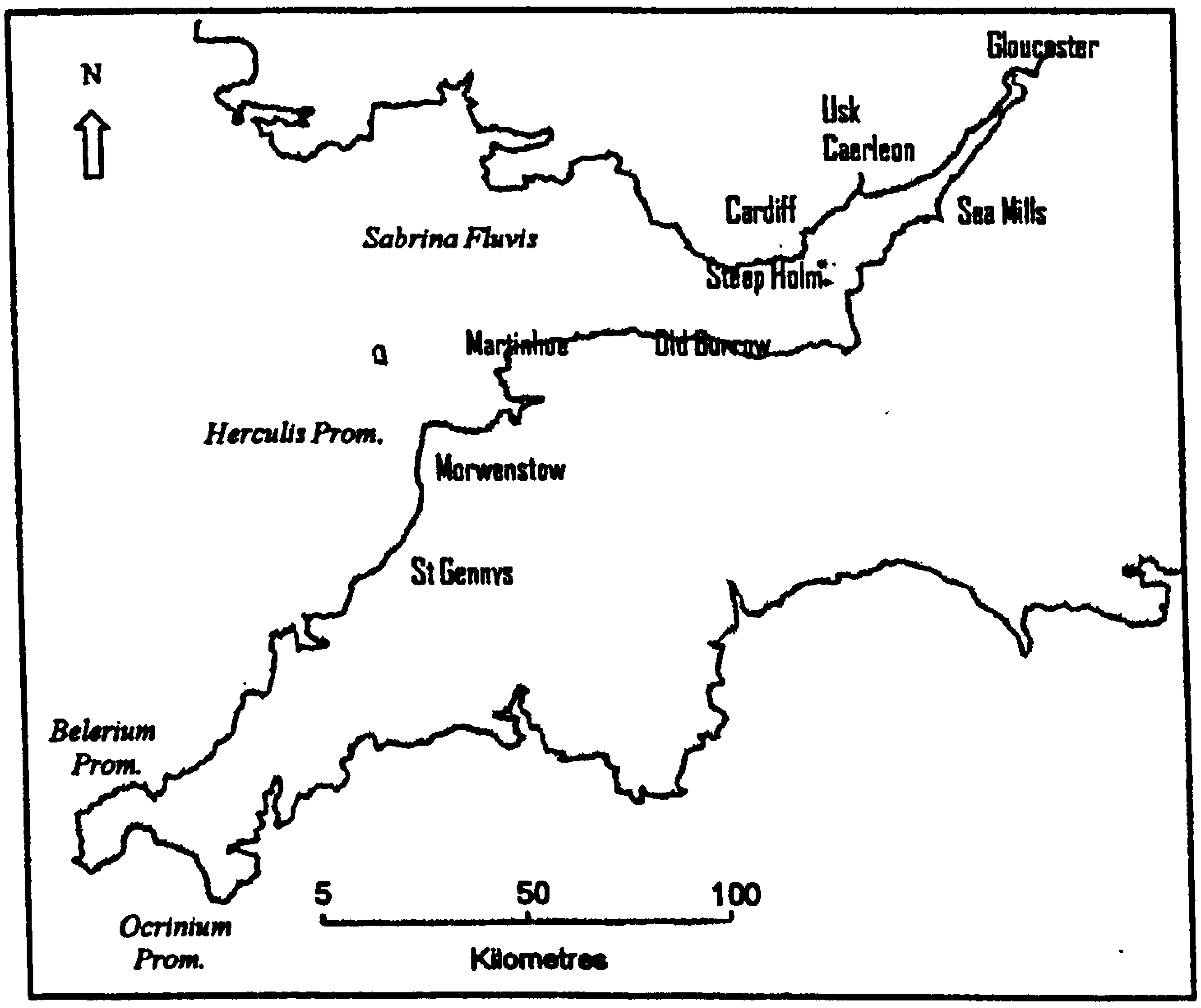


Figure 6.6. Sites mentioned in the text. Martinhoe, Old Burrow and Steep Holm have been confirmed as Roman by excavation. Morwenstow and St Gennys await further investigation.

<u>Soldiers from the sea – amphibious operations in the west of Britannia</u>

Jarrett (1994, 6) commented that "our land-bound experience restricts our thinking about early campaigns" and that "we easily neglect the possibility of combined operations". Regrettably, Michael Jarrett's premature death prevented his possible development of this theme, and the topic has not been extensively pursued by later writers. Manning mentions that the early fort at Cardiff "probably served as a harbour for a fleet operating in the Severn Estuary" (2000, 14), that later forts at Neath and Loughor served as minor naval bases (*ibid.* 28) but does not discuss the question of amphibious operations. Davies has much detail on the land based campaigns (some thirty pages), has a paragraph (2000, 35) on maritime communications, but makes no mention of operations in co-operation with the army. However, in writings this lack of coverage on possible seaborne operations in Roman Britain, is not confined to campaigns in Wales for, aside from a mass of publication associated with the Claudian invasion, to the writer's knowledge, only Martin, whose work is discussed below, has published anything of note on this topic (1992, 1-34).

The only classical accounts of naval/military combined operations in the study area are of the assaults on Anglesey, firstly by Suetonius Paulinus on the action in AD 60 (*Tac.Ag.* 14), secondly on Agricola's campaign in AD78 (*ibid.* 18). It seems that, in the first invasion, Suetonius had prepared a fleet of flat-bottomed vessels, probably at Chester, and that the assault was executed by infantry, carried in boats, and by cavalry (possibly Batavians), swimming with their horses. It is possible that hide-covered shields, used inverted as a form of coracle, or that inflated skins were used as floats (Parker 2003 *pers. com.*). The island was captured and a fort was built, but the Boudican revolt forced the abandonment of the conquered territory (Frere 1978, 104). Tacitus tells us that the plans for Agricola's assault "had been hastily formed and as a consequence he had no ships available". He committed a body of auxiliaries (again probably the Batavians), "who knew the fords, and had that facility in swimming which belongs to their nation, and by means of which they can control simultaneously their own movements, their weapons, and their horses. He then launched them upon the enemy, so suddenly that the astonished islanders, who looked for fleets of ships upon the sea, promptly came to the conclusion that nothing was hard and nothing invincible to men who fought in this fashion" (*ibid.*).

The problem of finding evidence for sites of amphibious landings is well demonstrated by the volume of writing on the place of landing of the invasion force of AD43. This is not the place to discuss the opposing arguments but, in essence there are two opposing "camps" with Cunliffe (1968, 255-72), Peddie (1987, 47-65), Frere & Fulford (2001, 45-55) and Grainge 2002, being convinced that the major invasion force landed at Richborough, but with Hind (1989, 1-21), Black 1998, 306-7 and Manley (2002) being equally sure that the landing took place in Chichester Harbour. In the case of the protagonists of Richborough, the archaeological evidence is limited to the remains of defensive banks and trenches and, in the case of Chichester, to some indication of a possible early supply depot. In neither case is there sufficient evidence for close dating to be established. As both these sites have been subjected to the closest archaeological investigation, it might be thought that evidence for this form of operation in the less well examined areas of Wales might be impossible to uncover. However, it is here suggested that some slight indication for amphibious operations might be revealed by study of the distribution of Roman camps.

<u>Roman Camps</u>

Fortified camps were built by the Roman army on the march, at each overnight stopping point, Vegetius writes that "it was as if the army carried with it everywhere with it a walled town" (*Mil.* 1, 21). These structures, of which over 400 are known in Britain, have been traditionally known as "marching camps" (Jarrett 1969, 123-6, Keppie 1991, 36-8; Jones & Mattingly 1990, 77-87; Frere & St Joseph 1983, 19-31; Peddie 1996, 59-79). The term "temporary camps" is sometimes used (e.g. Jones & Mattingly 1990, 77-88; Davies 2000, 5-7), but Welfare and Swann question how "temporary" any one defensive structure may have been. They point out that, without the most expensive and painstaking excavation, archaeology is unlikely to be able to distinguish earthworks constructed for an overnight stop, those used for a longer period during a season's campaign, or even from those sites which were regularly reoccupied, perhaps on an annual basis, in the course of prolonged operations covering several years (1995, 1). Some of the smaller camps may have functioned as construction camps for associated forts nearby and as it is not possible to discriminate between types of usage, the most widely used term, "marching camps", will here be used.

The defences consisted of a bank and ditch, usually in the familiar playing card shape, with protected entrances, usually on all four sides. Polybius (6, 27-34), Josephus (*BJud.* 3, 76) and Vegetius (*Mil.* 2.7) mention tents in describing the camps, saying that the tented interior of the camps mirrored that of permanent forts, in order that the soldiers were familiar with a standard type of layout.

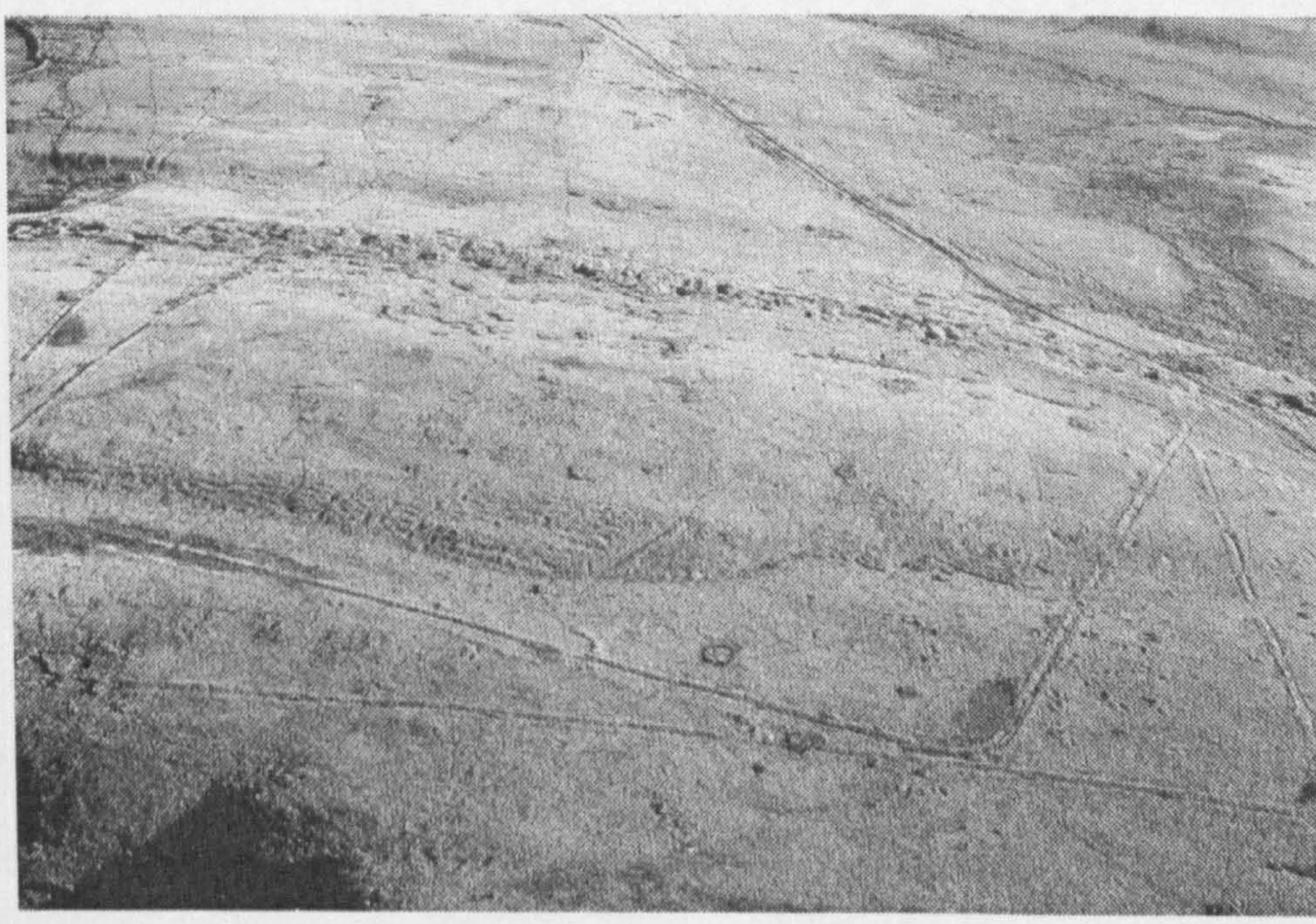
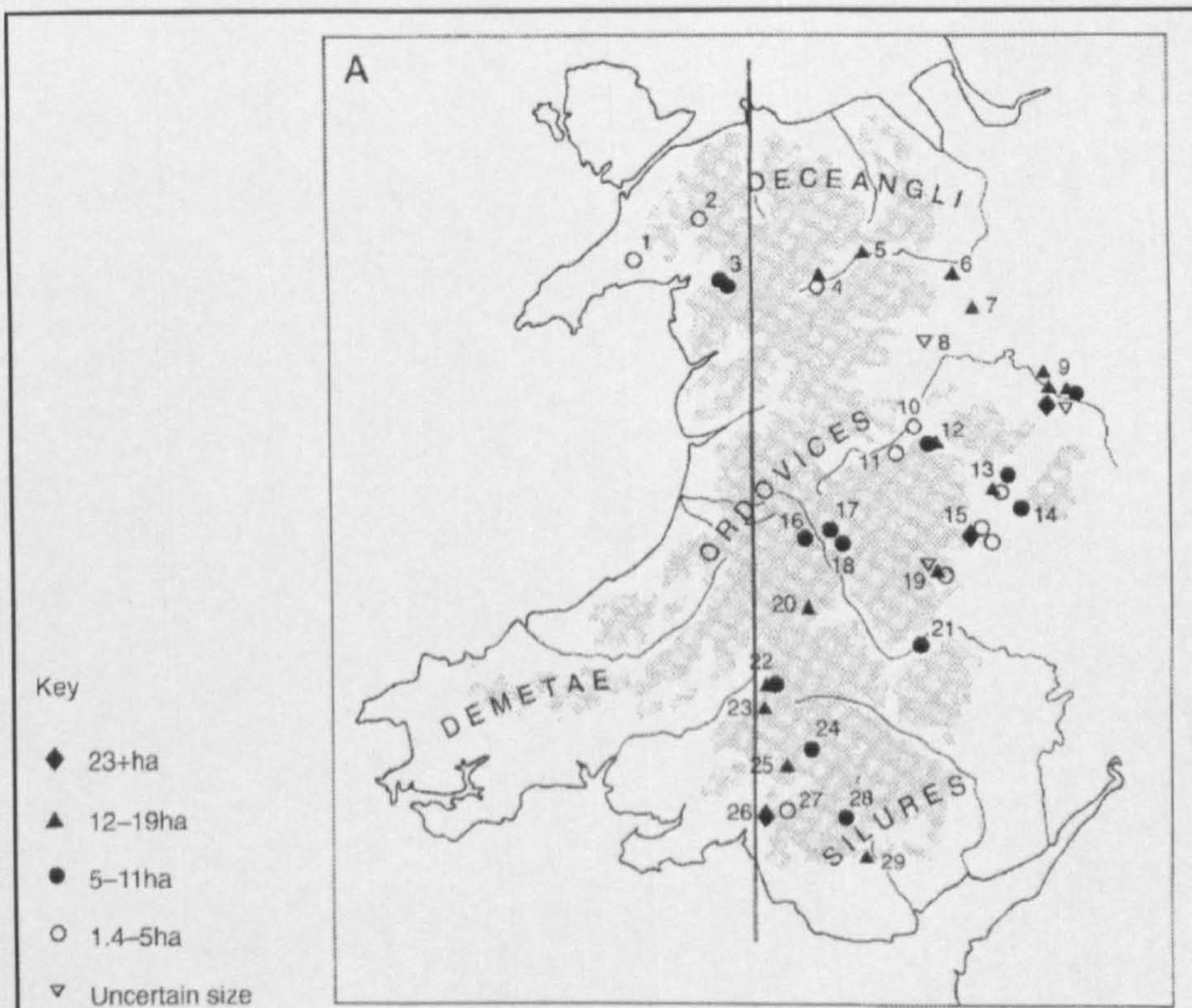


Figure 6.7. Two superimposed camps at Y Pigwn, 7 km south of Llandovery, Carmarthenshire, looking SE. The outer and larger (15.2 ha.) is the earlier, the inner encloses 10.3 ha. Both camps have gates defended by internal claviculae, virtually confined to the Flavian period. The two camps may represent successive campaigns by elements of the 2nd Legion accompanied by varying numbers of auxiliary troops. The SE sides of both camps have been damaged by later quarrying.

(Cambria Archaeology)

The size of the camps reflects the units on campaign; the two largest in Wales (Brampton Bryan and Blaen-cwm-bach) covered c. 25 ha., and were probably "forming up" points, where the army assembled at the commencement of a campaign. Camps greater than 10 ha. indicate the separation of the assembled army into brigade group formations and sites ranging from 8.5 ha., down to under 2 ha., at the lower end, probably indicate a single unit of auxiliary troops and at the higher end, the combination of legionaries, auxiliary cavalry and infantry, into battle group size. These camps are the primary indicators of Roman offensive operations. Jones and Mattingly (1990, 77-88) have used their locations to indicate the possible lines of advance during the campaigns during the conquest of Wales (Figure *6.2*).

The problem of associating camps with specific campaigns has been mentioned above; camps in mid and south Wales could have been the result of military operations under any of the Governors from the time of Ostorius Scapula (AD 47-52) to Julius Frontinus (AD 73-7). The situation in the area to the west and north is less confused, as Tacitus (*Ag.* 17) indicates that, aside from the assault on Anglesey by Julius Agricola described above, Julius Frontinus who was responsible for the final conquest of Wales. When compared with northern England and Scotland, only a small number of camps have been found in Wales and the Marches (Davies 2000, 5-7). It may be that this paucity of sites, particularly in west and north Wales, is the result of the conquest of the area having been achieved by amphibious operations, rather than by cross-country penetration over difficult terrain. A further probability is supply and replenishment by sea after the initial landings.



Key to location of marching-camps in Wales and the Marches:
1. Derwydd-bach 2. Penygwryd 3. Tomen-y-Mur 4. Llanfor 5. Penrhos 6. Rhyn Park 7. Whittington 8. Abertanat/Clawdd Coch complex 9. 'Wroxeter' complex (Cound Hall, Wroxeter I and II, Leighton, Attingham Park, Norton I and II) 10. Thornbury 11. Glanmibeli 12. Brompton 13. Upper Affcot/Stretford Bridge 14. Bromfield 15. Brampton Bryan, Walford, Buckton Park 16. Esgairperfedd 17. St Harmon 18. Trefal 19. Hindwell Farm 20. Beulah 21. Clyro 22. Y Pigwn 23. Arosfa Gareg 24. Ystradfellte 25. Coelbren 26. Blaen-cwm-bach 27. Carn Caca 28. Twyn y Briddallt 29. Pen y Coedcae

Figure 6.8. Location of marching camps in Wales and the Marches. Note only three camps to west of vertical line. (after J. L. Davies)

To the west of a line from Conway on the north coast, to Neath on the south coast of Wales, only isolated camps occur at Tomen-y-Mur, Derwydd-bach and Pengwryd. By contrast, between this line and a line drawn from Chester to Caerleon, twenty marching camps have been identified to the east of this line (*Figure* 6.9). To the west, permanent forts were established on or near to tidal estuaries, at Trawscoed, Pen-llwn, Erglodd, Pennal and

Brithdir, and the apparent absence of camps leading to them is surprising as, during the Agricolan campaigns is Scotland, the average distance between camps was 17 km (Peddie 1996, 74). Because of the known line of a Roman road running westwards from Carmarthen, forts are probable near Milford Haven and St David's. It is also unlikely that there was no military activity in the area bounded by the 100 km of coastline between Aberystwyth and St David's.

The absence of evidence for marching camps on the routes to the coast, leads inevitably to the suggestion that the most obvious explanation is that amphibious operations were employed to establish the majority of the coastal forts. A task force comprising, say, a legionary cohort, an *ala* of cavalry and two cohorts of auxiliary infantry (a total force of 2000), would provide a more than adequate force to establish a beach head, construct a marching camp and secure the surrounding countryside. On the arrival of supporting supply vessels, probably with pre-cut timber, and possibly with pre-fabricated towers and gates, a permanent fort of conventional 1st century type could be rapidly constructed.

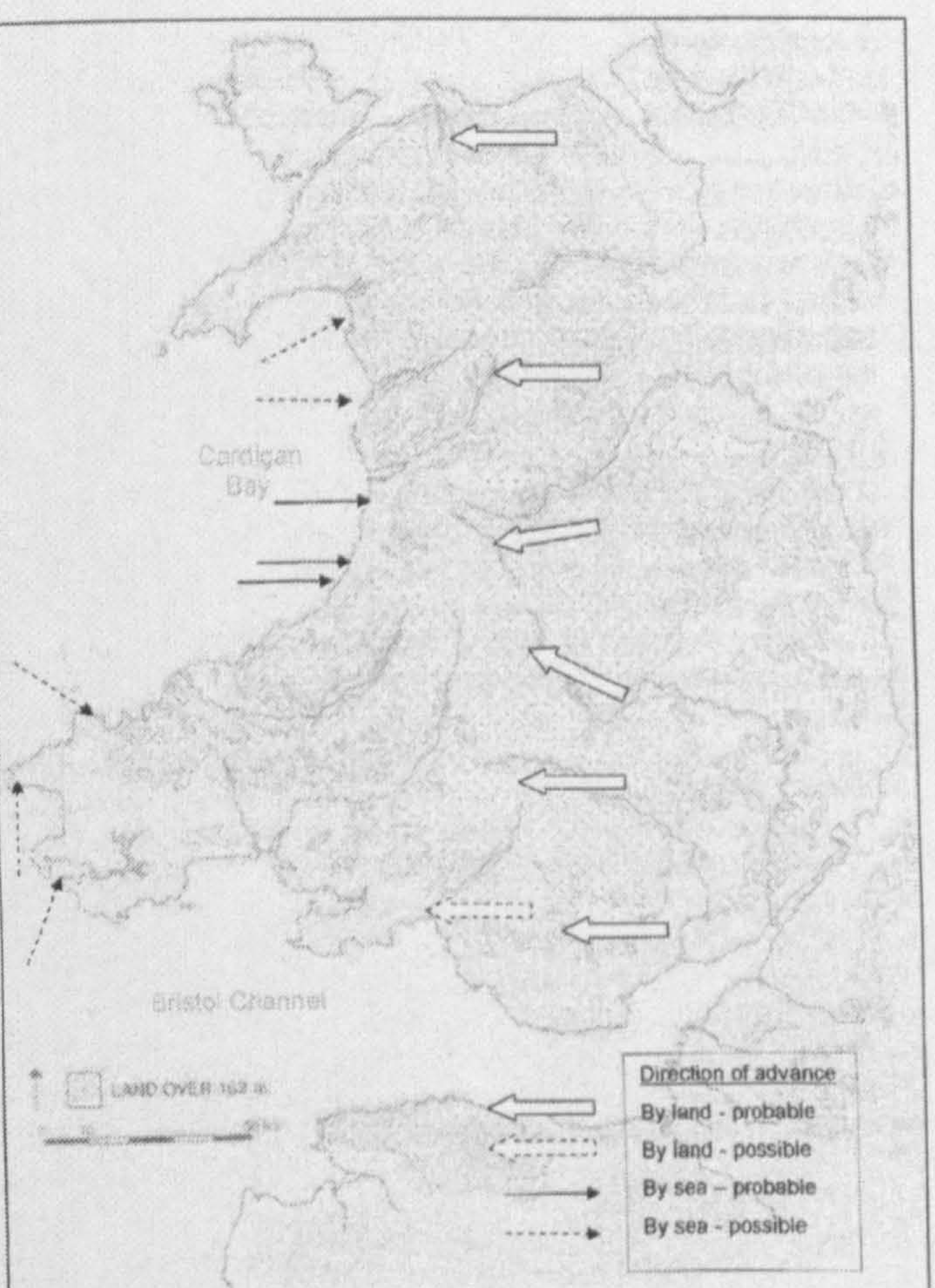


Figure 6.9. Suggested alterative strategy for the conquest of West Wales by amphibious operations. The arrows indicating directions of advance by sea, point to either a known Roman fort, or to a postulated location for a fort. This map should be compared with Figure 6.2 above.

The provision of transport vessels could have been solved by using some of the 800 vessels that had been needed for the Claudian invasion of AD 43. There can be little doubt that a considerable number of these were used in support of the Vespasianic advance in to the

West Country, and that the subsequent conquest of the Southwest peninsula would have drawn these, and further vessels to the west, at least as far as the great natural harbour at Falmouth. From there, with a possible overnight stop in Mounts Bay, close to either Newlyn or Penzance, and waiting for conditions of favourable wind and tide, a passage round Land's End, to the shelter of St Ives Bay would have presented few problems. A number of writers (e.g. Allen & Fulford 1996, 257; McGrail (1985, 16); Holbrook 2001, 152: Peddie 1987, 155-7) have drawn attention to the supposed difficulties of rounding Land's End but, having done this, in a small boat, on a number of occasions, the writer is convinced that this so-called problem has been greatly exaggerated, and further discussion, together with supporting evidence is later introduced. Whilst the north coasts of Cornwall and Devon present undoubted hazards to mariners, passage in easy stages, from haven to haven, presents few problems, and the postulated chain of coastal signal stations (above) would have proved of significant advantage. After a coastal passage and a possible stay in Porlock Bay, Hurlestone Point would have provided at convenient departure point for the island of Steep Holm, with its probable Roman station, would have led to a short run to Cardiff Bay and the major pre-Flavian fort.

Prior to the Claudian invasion, the construction of large numbers of ships for a specific task is demonstrated by Caesar's instructions (*BGall.* 3, 9-13) for reinforcements prior to the engagement with the Venetic fleet in 56 BC, his orders for construction of invasion craft in 55 and 54 BC (*BGall.* 4, 21; 5, 1-2), and the building of 1000 vessels for the Germanicus's expedition from the Rhine to the Ems in AD 15 (*Tac. Ann.* 2, 4). If the use of the invasion ships was not the preferred option, the Forest of Dean provided a ready source of timber and iron, and suitable locations for the construction of the required number of vessels. From here the newly constructed ships could easily reach an assembly point in Cardiff Bay in the space of two tides.

Grainge (2002, 45-61) has studied the work of a variety of authors and, combined with his own investigations, has concluded that a transport vessel of the invasion fleet was capable of carrying either 70 soldiers or 15 horses. The task force specified above, comprising 2000 soldiers and 500 horses, would therefore require some 30 troop transports and 35 horse transports. It is unlikely that the cavalry contingent would have accompanied the main amphibious task force, whose primary task would be to secure the landing area, establish a fortified camp and expand the bridgehead, with the cavalry arriving perhaps on the second or third day. Peddie (1997, 40-1) has estimated the number of ships needed to meet the logistical needs of the Claudian invasion fleet (draft animals, carts, artillery and rations, including two weeks reserve of grain), and, using his figures as a basis, the first wave would have been accompanied by 4 cargo vessels. Warships, probably *liburna*, at a ratio of one warship per 5 transports (Grainge 2002, 51), provide an escort force of say, 6 vessels.

As might be expected, the mountainous areas of Wales were not densely populated and have few hillforts, therefore any military advance through these areas is unlikely to have met with serious resistance. A map showing the distribution of hillforts larger than 1.2 ha. (Jones and Mattingly 1990. Map 3:18), shows only two coastal hillforts between St David's Head in the south and the Lleyn Peninsula in the north, suggesting a lack of tribal organisation, indicating that the possibility of an opposed landing was slight. A decision to strike for the coast by sea, rather than by land, would therefore have been a choice based on military expediency, rather than the avoidance of conflict.

It is of course realised that "Absence of evidence is not evidence of absence" and, as the apparent absence of marching camps is critical to any argument for sea-based offensive operations, the question must be asked as to whether this is illusory or real. An inventory, of all the known Roman temporary camps known in England, was carried out by Welfare and Swan (1995). Based on the field archaeology, details of over 130 camps were published but, drawing attention to their map showing the distribution of Roman camps in England the authors point out that it is "evidently incomplete". They suggest that "their fragile remains have survived best in the marginal lands of the North and West although even here, as elsewhere, some earthworks will have been masked by the growth of peat, or by later human activity: by cultivation, by the construction of Roman forts and medieval castles, and by the growth of farms and villages. There is little doubt that those that may have existed in the arable heartlands on the South and East of England will have succumbed in a similar manner, under intensive cultivation and with a dense pattern of settlement" (1993,3)

The suggestion of the use of amphibious operations as a major factor in securing the west coast of Wales can only be considered as the first tentative steps in the development of a sustainable hypothesis. Later, when "Directions of Future Research" are considered, some of the actions necessary to achieve this goal are put forward. However, there is some encouragement to be derived from the investigation of similar type operations in the north of Britain, and the work on this topic of Colin Martin (1992, 1-34) is now briefly discussed.

Naval/Military operations in the North of Britain

During Agricola's seven-year governorship of Britain (AD 77-83), he spent one year completing the conquest of north Wales, and then fought annual campaigns in the north of Britain, culminating in the Battle of Mons Graupius. Martin has concentrated on the penultimate campaign of AD 82 or 83, considering that a "synchronized supply service by sea" is implied by Agricola's capability to apply decisive military force in "the populous coastlands so far beyond his northernmost bases" (*ibid.*, 1). Martin's map of Roman forts and roads in North Britain during the late 1st century shows all sites that are believed have been occupied, for at least some time, in the late 1st century, but they were clearly not all in use at the same time (*Figure* 6.11, Martin's Figure 4, p13). He observes that, in contrast to the concentration of forts following the arterial routes on each side of the Pennines and Southern Uplands, "the eastern and western coastal margins, though not entirely devoid of garrisons, seem for the most part to be left unoccupied (*ibid.* 14). He suggests that, along the coast, the fleet established advanced replenishment depots, supporting a mobile task force striking "towards the seat of Caledonian power and operating without the encumbrance of heavy impedimenta" (*ibid.*, 1). On the east coast, possible landing places are suggested at Berwick, Cramond, Camelon, Bertha, St Madoes, East Haven and Dun. On the west coast, they are considered probable at Annan, Loch Ryan, Girvan and Irvine (*ibid.* 12-16).

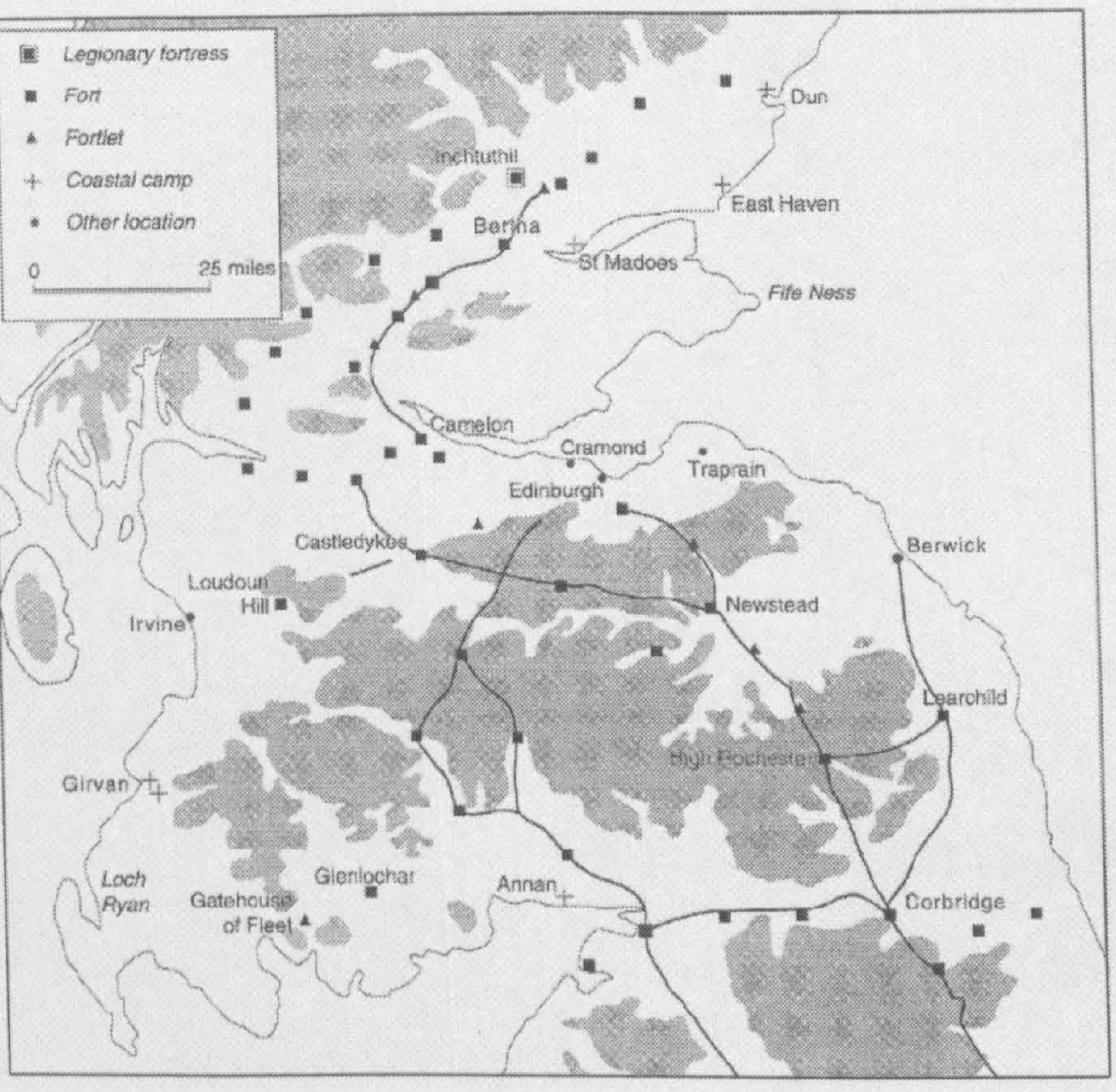


Figure 6.10. Roman forts and roads in North Britain during the late first century. Some of the information presented is speculative. (Martin)

Suggesting that the "overwhelmingly <u>terrestrial</u> military map that archaeology has recovered" (present writer's emphasis), may give a misleading impression of the "un-garrisoned" coastal margins, Martin further suggests that if lines of equal weight (for example, Jones & Mattingly 1990, Map 4.13, p. 75), indicating waterborne lines of communication are added, the picture becomes less distorted. The coastal territories are then seen to be dominated on one side by the system of roads and forts, and on the other by the activities of the Roman fleet.

Whilst emphasising that it is based on "no more than a qualified guess" Martin estimates the load carrying capacity of five tons for a *liburnia*, similar to those stolen by the Usipi (*Tac.Ag.* 28). Using an Egyptian 6th century ration scale, he suggests that such a vessel could have carried a minimum of 1,400 daily rations, and calculates that, based on a probable army size of 25,000, nine liburnian-size cargoes would have been required each day. There are few points on the east coast of Scotland that are more than 40 nautical miles distant from a bay, estuary or river mouth capable of providing shelter and beaching. Based on a speed of four knots, achieved by sail wherever possible, but with the use of oars when needed, daytime passages between such locations would have been easily attainable. After doubling the daily shipping requirements in order to allow for return trips, and allowing a further 50 per cent to cover turn-around times in harbour, Martin estimates that a fleet of 29 of this type of vessel would have provided an adequate re-supply capacity for the Agricolan army. He also makes the point that this role might be exchanged, on occasion, for "seaborne interdiction against coastal targets (*ibid.* 9 - 12).

Martin also considers later operations in the north, with particular emphasis on the campaigns between AD 208 and 211, led firstly in person by Septimius Severus and, following the onset of ill health, by his son Caracalla. He detects the employment of a radically new system "which, by employing water transport on a massive scale, could apply and sustain crushing military force at any chosen point in the dis-affected area with dispatch and economy (*ibid.* 20-21; 25-29). As the Severan campaigns were not intended to capture and hold territory, but were essentially punitive in nature, this seems to be an entirely reasonable assessment of changed tactics responding to a change of overall strategy.

There are significant differences between the North Britain amphibious operations, and those in Wales, for example, the support of a linear advance parallel to the coast, as opposed to landings intended to join up with existing seaward thrusts. The difference in scale is indicated by the size of marching camps, those on the north indicating the massive force of complete army, major elements of two or three legions together with a similar force of auxiliaries, whilst those in Wales would only accommodate a large legionary contingent, with accompanying auxiliaries. The most likely setting for the postulated Welsh amphibious operations is during the Governorship of Julius Frontinus (AD 74-77), and although a cavalry unit was almost destroyed in Ordivician territory in c. AD77/8 (*Tac. Ag.* 18), resistance was in its final throes. By contrast, the northern campaigns were into hostile territory, opposed by a well organised and, so far, undefeated enemy and therefore the likelihood of an opposed landing was much greater.

Changing role of naval operations in Britain

The demolition of the squadron headquarters at Dover took place c. AD 215, and brought an end in Britain to the operations of the *Classis Britannica* (but not to naval operations in Britain – see below). The last organised activity of a northern provincial fleet was probably that of the *Classis Germanica*, in the campaigns of Alexander Severus and Maximinus up to AD 235, and the naval forts were abandoned by the middle of 3rd century. There is evidence for warships (*lusoriae*), perhaps built by Aurelian or Probus, patrolling the Rhine c. AD 280 and Starr considers that naval activity continued during the 4th century, not as an organised *classis*, but as new smaller flotillas, each based on a single port and patrolling a small area (Starr 1960, 151;197).

Starr (*ibid.* 153) comments that, after the time of Agricola's governorship, "an almost unrelieved blackness hides any naval actions north of the English Channel for the next two centuries". In fact, naval operations in support of the army had occurred periodically, for example, during the Severan operations in Scotland, but for the majority of the period the major function had been the operation of seaborne replenishment of the Roman military, both men and materials and the conveyance of the *cursus publicus*. However, by the middle of the 3rd century, sea raiding and piracy were endemic, particularly in the North Sea, and the primary naval role became patrolling to combat seaborne coastal raiders, and to protect merchant shipping from piracy. It would seem that Carausius, who was an experienced naval officer, had some success in intercepting sea raiders, for he was eventually accused of waiting for them to accomplish their mission, and then relieving them of their spoils for his personal benefit.

The Saxon Shore forts have been the subject of much discussion with Frere (1987, 329-13; Esmond Cleary (1989, 43) and Faulkner (2000, 90-1) considering that their purpose was to counter piracy and seaborne raiding. Wright (1961, 29-13) thought that they were built by Carausius to defend the coast against the forces of Maximian, but this is unlikely, as they are too thinly spread to pose a serious obstacle to a determined invasion force. There is also little to commend the suggestion by White (1961, 29-30) that the so-called Saxon Shore forts in the west of Britain, at Lancaster and Cardiff, and the fortified base at Caer Gybi at Holyhead, were built by Carausius as a defence against an attempt to recover Britain for the Empire. Recent opinion (e.g. Wood 1990, 93-97) has tended to emphasise that, along with other military posts and fortified ports, they fulfilled a role in the economic and military supply system, functioning as secure bases, where goods and supplies in transit could be held in temporary storage, protected by massive defences, and with a garrison of only modest size.

Later naval operations in the west of Britain - the Irish raiders

The west of Britain faced barbarian raids from the Scotti (a name which seems to have meant "the plunderers"), and it is as raiders that the Scotti of Ireland are most frequently mentioned in classical sources. In AD 359/360, the *magister equitum* Lupicinus, was sent by Julian to take two bodies of *auxilia palatina* and two *numeri* across the Channel during the height of winter, because "the wild tribes of Picts and Scots broke their undertaking to keep peace, laid waste to the country near the frontier, and caused alarm among the provincials, who were exhausted by the repeated disasters they had already suffered" (*Ammianus* 20.1). The small number of troops, (possibly in the order of two thousand), cannot be seen as a response to a full-scale invasion, and were probably for the purpose of stiffening morale, and fulfilling the traditional role of the field army in providing a high-quality strike force. Ammianus writes of "a concerted attack by barbarians" in AD 367/9 and states that the disturbances seemed to have been pre-planned and, as a consequence, very widespread. In his panegyric to Stilicho, Claudian writes that, about 398 AD, "the Scots had raised all Ireland against me (Britain) and the sea foamed under hostile oars" (*Stil.* 2. 251).

For the study area, the results of these incursions are probably indicated by a number of significant finds in Ireland, dating from the late 4th or early 5th century. Several hoards of bullion have been found, one from a hillfort at Freestone Hill, County Kilkenny, containing coins of Constantine dating from AD 337, and another a collection of silverware that had been deliberately cut into pieces of equal weight, and appearing to be bullion silver. These finds were originally interpreted as barbarian "loot", but the presence of silver ingots, most of them bearing an official stamp, suggest that they may be more plausibly seen as a late Roman payment or subsidy, to keep the peace (Harbison 1988, 185). It is often supposed that the sole purpose of these raids were the enjoyable pastimes of "ravening or raving, pillaging and looting and, in other words, fun" (Reece 2002, 69), however, there is some evidence that, on occasion, eventual settlement followed. By the end of the century, Scots from Ireland were settling in the Lleyn peninsula of North Wales, the Gower peninsula of South Wales and the Southwest Peninsula of England (Frere 1978, 406; Thomas 1972a 260-5; Wooding 1996, 37-8).

At this time, Britain was protected by an army (we do not know how large, but c.12, 000 may be a reasonable estimate) that was effective for the time at which it existed. The later Roman army is sometimes compared unfavourably with the first century troops of say, Augustus, Claudius or Vespasian, but this view is perhaps coloured by the undoubted differences in organisation, status and equipment. A parade of a 1st century legion would have been impressive, with some four thousand heavily armed infantry, together with artillery, engineers and cavalry, dressed in parade uniform, drawn up by cohort and century, and drilling with a precision which would have been comparable to that of today's Brigade of Guards. By comparison a 4th century legion, whilst possibly retaining the same title, would have consisted of perhaps one thousand lightly armed cavalry, similarly but not identically uniformed, and bearing more than a passing resemblance to the Norman cavalry employed at the battle of Hastings (Holder 1982, 97-103). From the *Notitia Dignitatum* it is reasonable to infer that the *Dux Britanniarum* was probably based at York, with a responsibility for the security of the northern frontier and that the *comes Litoris Saxonici* commanded from the Wash to Solent. The sections of the *Notitia* referring to the West and Wales are absent, so we have little firm evidence for the military organisation in those areas at that time. The *Comes*

Britanniarum probably commanded a small detachment (c. 2000 men) of the field army that was stationed in Britain at an uncertain date.

However, defence of the coastline of western Britain against sea-borne raiders, was a near impossibility, whether attempted by land-based forces, or by ships of the local fleet. Starr, perhaps unfairly, suggested that patrolling the Welsh and Scottish coasts would be prevented "both by the traditional fear of the ocean and by the character of the warships, for the British fleet seems to have retained the Mediterranean trireme and liburnian" (1960, 153). This comment on the supposed deficiencies of the vessels, and the morale of the sailors, is not consistent with his remarks on the following page when he refers to the rounding of the north coast of Scotland by the Agricolan fleet (1960, 154).

The element of surprise gave a power out of all proportion to the probable numerical strength of the raiders and navigable rivers, such as the Severn, gave the opportunity for deep penetration. New forts were built at Cardiff and Lancaster, a small fortified harbour was built at Holyhead, there was limited re-occupation at both Neath and Loughor, and these are probably an indication of locations for naval units, as well as the "secure base" role described above. The apparent absence of fortified naval bases on the English side of the Bristol Channel is perplexing, and it is surprising that one or other of the 1st/2nd century fortlets at Old Burrow or Martinhoe was not re-activated, in order to provide an early warning system for the presence of seaborne raiders. Towards the middle of the 4th century, the defences of Caerwent were modernised by the addition of projecting towers or bastions, so that covering fire could be provided along the face of the wall, but it is difficult to accept earlier suggestions that these were designed to mount artillery (*ballista/onager/catapulta*). It is possible that this could have been the case at the Saxon Shore forts, but, as in modern armies, artillery is a specialised function, and it is unlikely that the citizens of a *civitas* such as Caerwent would have had the necessary expertise. In any case, the use of catapults against small bodies of lightly armed invaders would seem inappropriate. Nevertheless, the external bastions would have given an impression of great defensive strength and, if manned by a local militia, possibly equipped with "army surplus" from Caerleon, would provide an illusion that might lead potential attackers to "try their luck" elsewhere.

Conclusion

It is clear that Roman naval units, operationally responsible to the local military commander, played a significant part in the conquest and consolidation of western Britain. Naval and naval/military operations have been discussed in this chapter, Roman logistical systems were discussed in Chapter 4 and, in the Chapter 10, an assessment is made of the number of vessels operating in the naval, transport, supply and replenishment roles.

Perhaps the most valuable facet of this chapter, is that during the research, two opportunities for further study have become apparent. Firstly, the suggestion of a chain of signal stations running along the north coast of the south-west peninsula, is a completely new concept and will require significant further research and fieldwork, and in particular the examination of aerial photographs to identify potential sites. Secondly, the hypothesis suggesting an amphibious based strategy for the occupation of the coasts of West and southwest Wales is equally new, and may be best served by early publication and therefore exposure to critical scrutiny by experts in the fields of Romano-British and/or maritime archaeology.

Chapter 7. The development of rivers, ports and landing places

Introduction

Knowledge of the level of competence of Rome in matters of inland water transport, in other parts of the Empire, is necessary for an understanding of the degree of use of rivers in *Britannia.* It will be argued that Roman military engineering was more than capable of improving and maintaining these rivers; thereby establishing an effective system of inland waterways. By contrast with later periods, Roman law provided legally enforceable constraints protecting the rights of navigation, and this compares favourably with the situation facing the "improvers" of the $17^{th}/18^{th}$ centuries, who needed to spend much time and effort in pursuing legislation for removal of obstacles, before any work could be commenced.

The problem of locating structural evidence for waterside structures of the Romano-British period is well demonstrated by their absence from the Bristol Avon. This river was a busy Roman waterway, probably with quays at Bath, equipped with cranes for loading large blocks of Bath Stone, a landing place serving the important villa at Keynsham, another for the walled settlement at Gatcombe, and a significant port at Sea Mills. The only surviving remains for any of these structures is a small piece of walling at Sea Mills that may, or may not, have formed part of the port wall. The remains of Roman riverside structures are unlikely to have survived the development of quays at Bath, serving the Kennet and Avon Canal, the construction of wharves for Fry's chocolate factory at Keynsham and the development of a "wet dock" at Sea Mills. As for Gatcombe, it lost its significance at the end of the Roman period, and any landing place has long since been eroded away by tidal action.

That this problem is not confined to the study area is shown at York, where the fortress is situated at the junction of two rivers, the Ouse and the Foss. The course of the rivers in Roman times is not altogether certain, the Ouse probably has not changed a great deal, but the Foss was substantially altered by the creation of the King's Fish Pool in the 11^{th} century, and by canalisation in more recent times. There is considerable evidence of overseas trade at York during the late 2^{nd} and early 3^{rd} centuries, but despite considerable efforts to establish the location of the quays, their whereabouts is not yet known. Ottaway (1993, 85) is able only to suggest that there were major waterfront structures "somewhere on the banks of the River Ouse", where ships plying coastal and overseas trade could load and unload. That the lack of archaeological evidence is not confined to the Roman period, is demonstrated by the recent surveys of the Welsh coast, designed to record the archaeology situated within the coastal zone. The authors comment that "there is virtually no direct evidence of maritime trade in the archaeological record: apart from the dock incorporated into Beaumaris Castle Anglesey, there are no surviving quays wharves or jetties of medieval date" (Davidson 2002, 61).

Cleere (1978, 36) pointed out the imprecision of use of the term "harbour", commenting that this, and related terms such as wharf, quay, port, jetty, etc. are often used indiscriminately by archaeologists. This is undoubtedly true, but his all-embracing use of the word to cover "any installation from which goods and passengers could be transferred from ship to shore, and vice versa", fails to discriminate between such dissimilar sites as a beaching place or a plank place on a river bank, and the massive waterside structures of the Roman port of London. For this reason, and accepting the possible in-exactitude of the terminology, in this work the terms originally used by the excavator/s will be used, wherever possible.

Roman competence in fluvial engineering

The conquest of Egypt had given Roman engineers direct access to long established expertise in waterway management, linked to the Nile, and this knowledge was put into practice in Italy. Some of the upper reaches of the Tiber (as far as Citta di Castella in the Appenines, 180 miles inland and 300 metres above sea level) were made navigable, and used for the transport to the city of farm produce, building stone and timber. Pliny (HN. 3.53) comments that the Tiber is "at first a narrow stream, only navigable when its water is dammed by sluices and then discharged, (writer's emphasis) in the same way as its tributaries, the Tinia and the Chiana, the waters of which must be collected for nine days, unless augmented by showers of rain". This technique is similar to the use of "flash locks" on the Medieval (and later) waterways of Britain. The *Fossa Augusta* linked the River Po to the home port of the Roman Adriatic fleet at Ravenna. Strabo describes how Scaurus drained the plains to the south of the River Po "running navigable canals from the Padus (Po) as far as Parma, for near Placentia the Padus is joined by the Trebia, as also before that by several other rivers, and is thus made excessively full" (Geography 5.1.11).

This expertise was transferred to the Northern Provinces where, for example, the *Fossa Drusiana* was built by Drusus to link the Rhine to the Yssel. Tacitus describes the campaign of Germanicus in AD 17 when he "sent on his supplies and assigned the vessels for the legions and the allied troops, entered the Fossa Drusiana, as it was called, and he arrived after a prosperous voyage through the lakes and the ocean as far as the River Amisia" (*Ann.* 4.8). Strabo refers to portage from one navigable point to another in Gaul, when he comments that "The course of the rivers is so happily disposed in relation to each other that you may travel from one sea to the other, carrying the merchandise only a short distance, and that easily across the plains, but for the most part by the rivers, ascending some and descending others." (*Geography* 4.1).

River improvement

Whilst the removal of obstacles to navigation is of great importance, perhaps the most significant engineering method employed is the use of locks, to permit boats to ascend or descend rivers and canals, and this technique is known from early times. Herodotus (2.138,

158) attributes the first canal linking the Nile to the Red Sea to Necho II (610-595 BC). The canal was over 60 miles in length and was wide and deep enough to take large sea-going vessels. There is a difference in levels between the Nile and the Red Sea, and "The Ptolemaic kings cut their canal and made it so that it could be closed so that, when desired, they could sail into the sea without difficulty, and also sail back". Referring to the differences in levels between the River Nile and Lake Moaris, Strabo comments that "Locks have been placed at both mouths of the canal, by which the engineers regulate both the inflow and outflow of water" (*Geography* 17.1.25).

In AD 112, Pliny the Younger, who was at that time Governor of Bithynia, wrote (*Ep.* 10. 41) to the Emperor Trajan that "there is a sizeable lake in the area of Nicomedia across which marble, farm produce, wood and timber are easily and cheaply conveyed by boat right up to the main road, from which, with great effort, and even greater expense, carts take them to the sea". Pliny proposed the construction of a canal linking the lake with the sea and Trajan approved the idea in principle, offering the services of an experienced surveyor. The lake was some 20 m above sea level, but the correspondence shows that the Romans were not greatly concerned about the problem of changes of level in their waterways.

Pound locks, as used on modern rivers and canal systems, consist of two gates close together, which permit the transfer of a vessel from one level to another. When proceeding upstream, a vessel enters the area between two gates, the downstream gate is enclosed and "paddles" in the upstream gate permit water to fill the area between the two gates. Whilst the area between the gates rises to the upstream water levels, the upstream gate is opened and a vessel is able to proceed; the process is reversed when proceeding downstream. However, it is by no means certain that pound-lock technology was in use in Roman Britain, and whilst some literary evidence (above) indicates that some form of locks were in use, particularly in the Mediterranean area, there is no archaeological evidence to attest the use of these devices in Britain or elsewhere in the Northern Provinces. The flash lock was a less sophisticated device, consisting of a gate, or a set of horizontal boards, spanning a gap in a dam across the river. Water flows from the higher into the lower level after the gate is raised, and when a balance is achieved a vessel is moved either up or down river, and the gate is then closed. The use of flash locks was dependent on water levels and, from a later period, Willan echoes Pliny's comment above when he points out that the replenishment of water above a lock on the Thames, to a level sufficient to allow further navigation up-river, "could take anywhere from two hours to a month or six weeks" (1964, 88).

Justinian's Digest of the Law

The importance placed on unimpeded use of rivers, is well illustrated by certain edicts contained in Justinian's (AD 482-565) "Digest of the Law" (*Codex Justinianus*), published in AD 530, and codifying all Imperial constitutions, dating from the time of Hadrian, that were still valid. Some 95% of the work is taken from authors of the period between AD 100 and 250 and, in particular, all the edicts summarised below (and detailed in Appendix 3) are the work of the jurist Domitius Ulpianus, who at the time of his death in AD 223 held the office of *praefectus praetorio.* The extracts from Book 43, quoted below, clearly give support to the contention that river navigation, during the Romano-British period, was not impeded by the weirs etc., which bedevilled medieval navigation.

Edict 12 is intended to prevent anything from being done in a river, or on its bank, to hamper navigation (*De fluminibus. Ne quid in flumine publico ripave eius fiat, quo peius navigatur.).* It states that "You are not to do anything in the public river or on its bank by which the landing or passage of a boat is or shall be made worse". Edict 13 states that nothing should be done in a river which might cause the water to flow otherwise than it did last summer (*Ne quid in flumine publico fiat, atque uti priore aestate fluxit.*). The provision is made to prevent a river drying up because of unauthorised tapping by watercourses or by changing its bed and applies to all rivers, both navigable and un-navigable. Edict 14 deals with navigation in a public river (*Ut in flumine publico navigare liceat*) and forbids "the use of force against such a one to prevent him from travelling in a boat or raft in a public river, or loading or unloading on its bank". This edict is later echoed by an English Act of Henry VI (9 Hen. VI. c. 5), that declared the River Severn to be a free river for all the King's subjects, to "carry on within the stream of the River". Edict 15 deals with "Building up a bank" (*De ripa munienda*) and prohibits "the use of force to prevent such a one from doing any work in a public river or on its bank for the purpose of protecting the bank or the field which adjoins the bank, provided that navigation is not made worse by it." (Mommsen *et al.* 1985, 578-82)

I am grateful to Neville Morley (*pers. com.* 2002) for pointing out that the extent to which this legislation was enforced, or enforceable, cannot be ascertained, particularly in a distant province such as *Britannia.* However, it does at least indicate that if an impediment to navigation needed to be removed, it could be done without recourse to the tedious legal processes, that made the later improvement of English rivers such a drawn out process.

<u>*Roman river transport in Britannia*</u>

Writing of the British rivers Tacitus comments; "I would only add one remark, that nowhere else does the sea make its power more felt: the tide causes long stretches of the rivers alternately to ebb and flow, nor does it simply rise and sink upon the shore, but it runs far inland, and winds about and makes its way into the very heart of the hills and mountain chains, as if the sea were lord of all" (*Ag.* 10). Most rivers may be made navigable, if an adequate labour force is available to construct dams to produce a ponding-up effect, similar in function to the later "flash locks". A suitable supply of slave labour would have presumably been available, as a result of the defeat in battle of the Welsh tribes under Caractacus (possibly at Llanymenech). Roman landing places have been found at Gloucester, Chester and

Caerleon. As carriage by road was expensive but by water was relatively cheap, it is probable that the Romans would have exploited the rivers to the maximum potential. The great flat-bottomed lighters that plied the Rhine and its tributaries would have been far too large, but vessels the size of the "Barland's Farm" boat (*Figure* 3.12) would have had no difficulty in navigating the River Severn as far as Pool Quay, near to Welshpool (Nayling *et al.* 1994, 596-603). It must also be a probability that vessels of similar size could reach as far as Forden Gaer, Caersws and possibly beyond. During the excavation at Caersws, the principal buildings of the fort were found to be of a type of sandstone of which the nearest outcrop is at Welshpool. It was the view of the excavator that the building stone, probably dressed at source, had been brought up river to the fort, either by boat or on rafts (Britnell, J. 1999, *pers. com.*) Today the river has a reasonable depth of water, certainly as far as Llanidloes, and appears to have potential for earlier navigation to that point. Whilst it may be an unreliable preservation from the folklore, the area upstream of the present bridge is known as "The Harbour".

The study area displays significant variations and it is only necessary to compare and contrast the mountainous topography of the Cambrian massif with the wetland plains of the Somerset Levels, for it to be obvious that completely different problems for transport by water exist, and that equally different solutions are required. In the case of the Somerset Levels the problem is mainly that of tidal inundation, and the solution is the embankment of rivers such as the River Parrett, providing not only an increase in the depth of navigable waters, but also protection against flooding of valuable agricultural land. Navigability to the Roman town at Ilchester (*Lindinis?*) is highly probable (Cox 1950, 95) as, though 49 km from Bridgwater Bay, the town is situated at only 11 m above sea level (a rise of 0.22 m per km) and is only 3 m higher than the port of Bridgwater, itself 19 km from the sea. By contrast, the fort at Llandovery, situated on the Afon Twyi, is 68 km from Carmarthen Bay; by this point, a height above sea level of 73 m (a rise of 1.07 m per km) has been attained. Clearly, a major program of river improvement, involving debris clearance and the probable use of flash locks, would have been needed in order to achieve navigability. The question of cost-effectiveness, mentioned earlier, would also come into play, as Ilchester was a key point on a trans-isthmian trade route, and would justify the Roman canalisation of the river (Thew 1994. 134). On the other hand, water transport to Llandovery had reached the effective limit of navigation, with no opportunity for onward shipment, and consequently no additional economic advantage.

The Romans would have developed the use of British rivers, even if transhipment and portage were required. This is illustrated, for example, by the movement of Black-Burnished pottery from the Poole Harbour area (Allen & Fulford 1996, 223-281). They suggest that the pottery was transported by pack animals to Ilchester, then by barge via the Rivers Yeo and Parrett to a port on the Bristol Channel. Some was re-loaded to coastal vessels (similar to those illustrated in *Figures* 3.1, 3.5 and 3.6) for distribution to the ports of South Wales, and shipment through the Irish Sea to the forts of North Wales, North West England and the garrisons of Hadrian's Wall. The Rivers Severn, Wye and Usk provided access far into the interior, and the apparent absence of roads leading to some isolated villas located on the riverbank suggests a reliance on water transport. Equally, the Roman programme of road building provided an effective method of cross-country transport, and pottery found in the fort at Caersws, in the upper reaches of the River Severn, consisted of 85% Cheshire Plain ware, as opposed to 15% Severn Valley ware (Britnell 1989, 85-7). This suggests that the supply depot of the 20th Legion at Chester was responsible for overland provisioning and maintenance, and that, in this case, shipment via the Severn played only a minor role.

Archaeological evidence from the study area

Chester *(Deva)*

Most publications on Chester, and many on Roman Britain in general, have featured photographs of a section of the "quay wall", well preserved alongside the racecourse on the Roodee (*Figure* 7.1). Recent research attempting to determine changes in sea level since the Roman period, have included the study of probable tidal levels at Chester (Waddelove & Waddelove 1990, 253-66; Ward 1996, 4-11), and Mason (2002, 59) has been led to reconsider this structure. He argues persuasively that the height of the quayside would be some 5 m higher than the deck level of a vessel tied up alongside and, quite correctly, points out that this "is clearly a nonsense". He conjectures that this structure was a wall, not a quay, and was intended to protect the western section of the *canaba,* the wealthiest area of the extramural settlement.

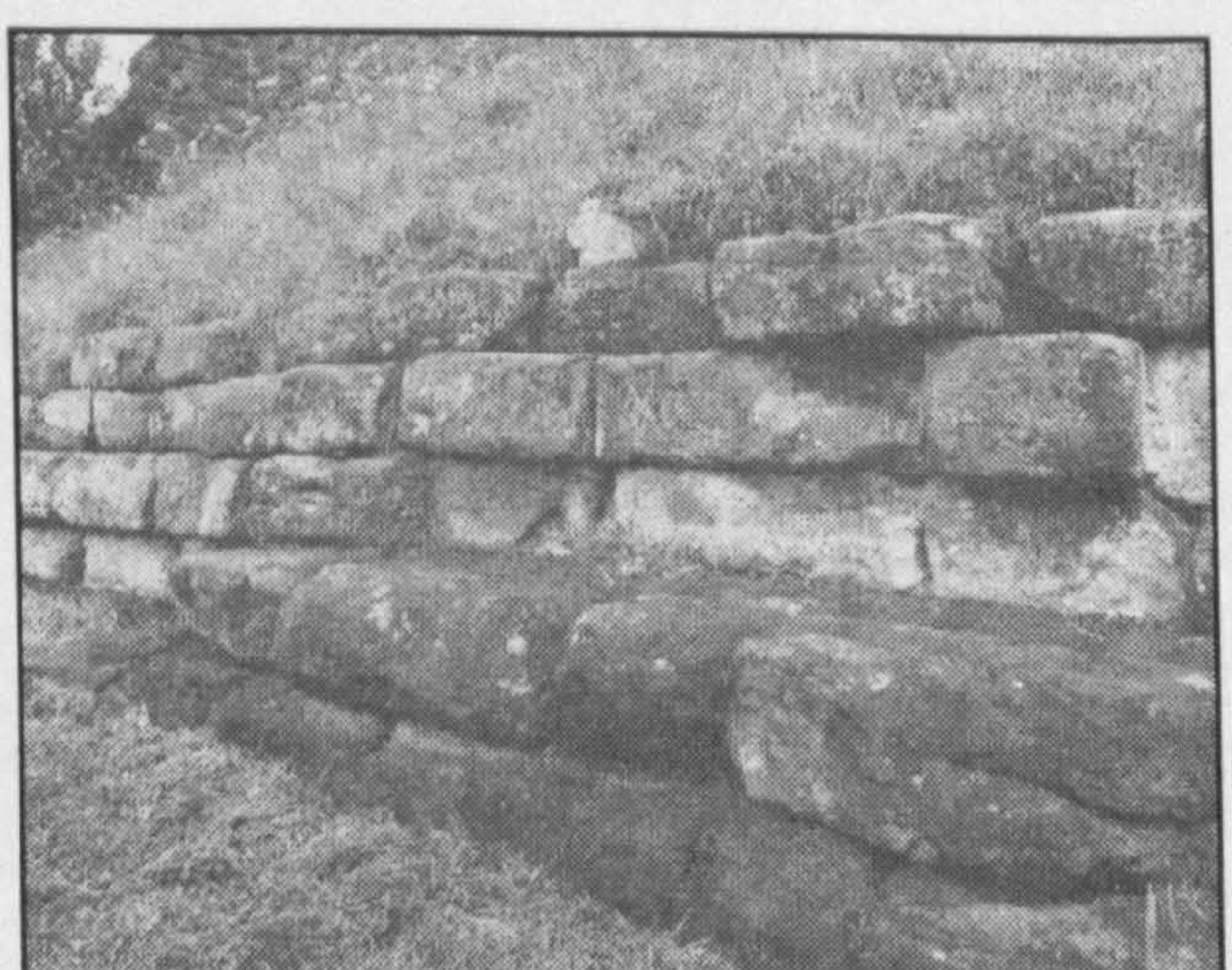


Figure 7.1 A section of the Roman "quay wall". (Chester City Council)

Excavations in 1885 revealed the ancient riverbed at a depth of about 6 m below ground level, where lengths of oak timbers set in concrete were found (Shrubsole 1887, 80). The timbers were some 3 m in length, averaging 0.30 m in diameter, having a point at the embedded end, encased in an iron sheath (*Figure* 7.3), enabling them more easily to be driven into the riverbed.

Roman material was found, including bricks and tiles, Samian ware and other types of pottery and, most importantly, an ingot of lead bearing a date manufacture of AD 74. Iron sheathed timber was commonly used in the construction of bridges, wharves, and jetties during the Roman period and Mason suggests a landing stage projecting into the deepest part of the river channel allowing ships to tie up alongside at most stages of the tide (2002, 64-72).

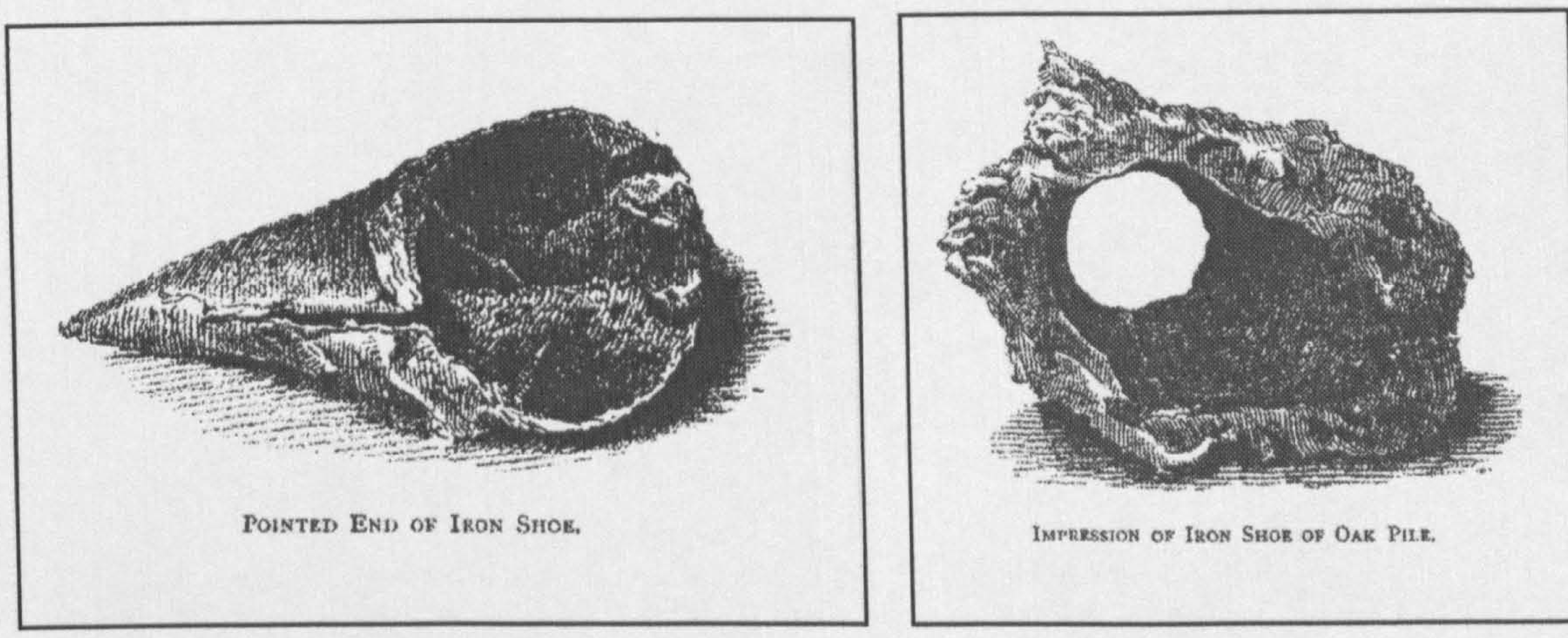


Figure 7.2. Drawings of iron shoe from wooden piles - 1885. (Chester City Council)

Caerleon *(Isca)*

Excavations at Caerleon, directed by Boon in 1963, revealed a well-built stone and timber quay (*Figure* 7.3), lying 230m from the present line of the riverbank, at a height of 6.56 m above Ordnance Datum. It is extremely unlikely that it was the only quay, since it was not constructed until the early 3rd century, and there must have port facilities from the time of the foundation of the fortress. Based on data obtained from the excavation, there have been a number of attempts to ascertain the level of tidal heights during the Roman period (Boon 1978, 24-36; Waddelove & Waddelove 1990, 253-66; Toft 1992, 249-54).

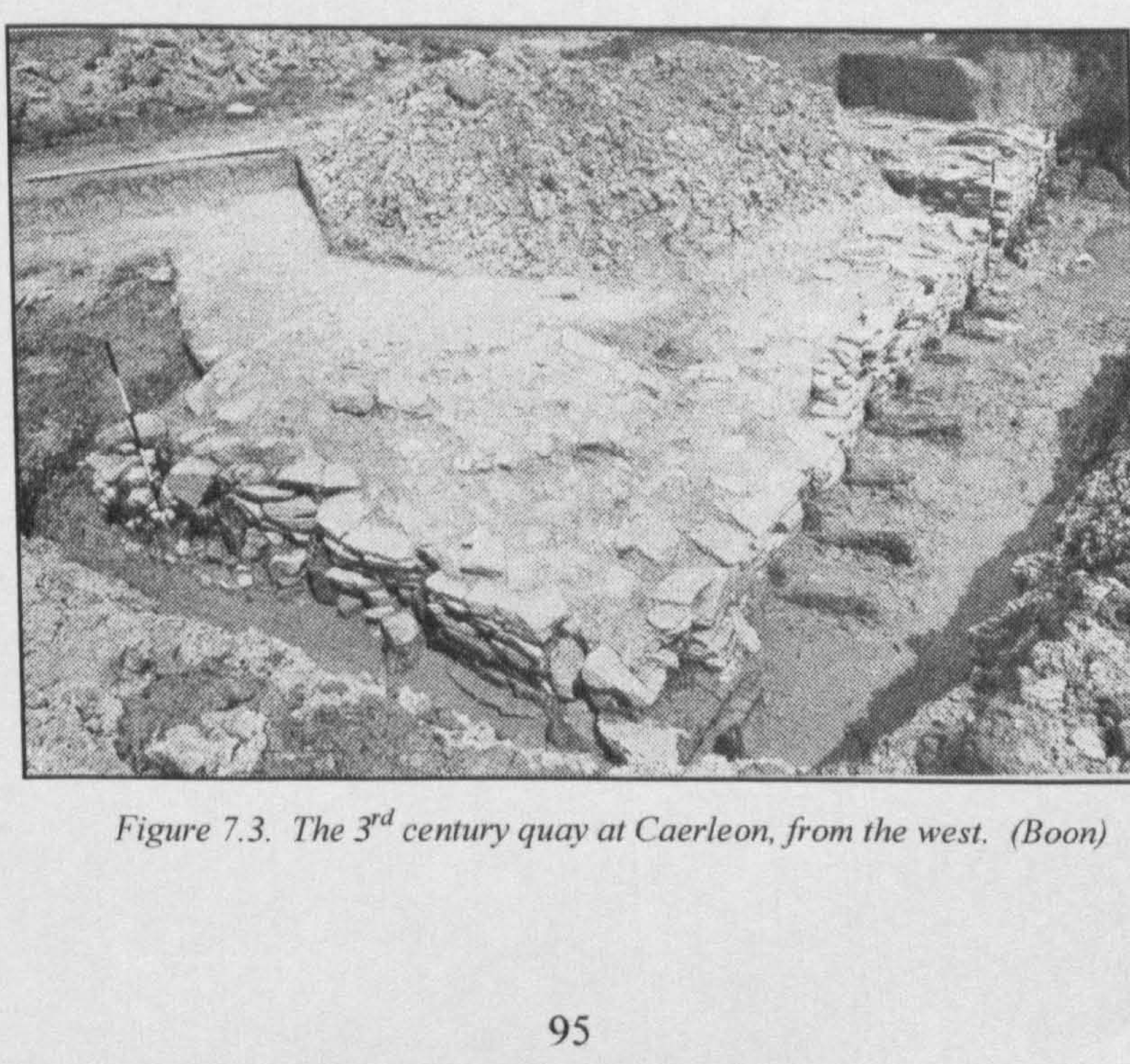


Figure 7.3. The 3rd century quay at Caerleon, from the west. (Boon)

Gloucester *(Glevum)*

Hurst (1999, 123) comments that "Despite the fact that a river-side setting is self-evidently the major factor explaining the siting of the fortress and *colonia* (and indeed all the habitation areas of Roman Gloucester), the study of the Roman and early medieval waterfronts must be counted as a failure of the last 30 years, reflecting the piecemeal response of the city's archaeology to modern redevelopments". He points out that opportunity for major investigation have not been lacking, but that only small-scale excavations have been carried out and that most information comes from observation of contractors' trenches and boreholes. The course of the River Severn changed during, and since, the Roman period (*Figure* 7.4) and part of a quay, composed of massive masonry, has been found on a line set back from the contemporary course of the Severn. In a creek off the river, there is evidence of a late 1st century harbour, with timber wharves or landing stages. At Quay Street, limestone rubble had been packed on top of timber piles, probably as a foundation wall to protect the reclaimed ground. The main road leading from the west gate ran parallel, and a number of wooden drains hollowed from tree trunks, were nearby. The area was reclaimed with dumps of rubble, and a new quay wall constructed in the 3rd century. This area presumably contained warehouses, but one building containing a mosaic and a column portico indicates some residential occupation. During the 3rd and 4th centuries, a number of buildings were deliberately demolished, with their sites remaining vacant (Wacher 1995, 150-167).

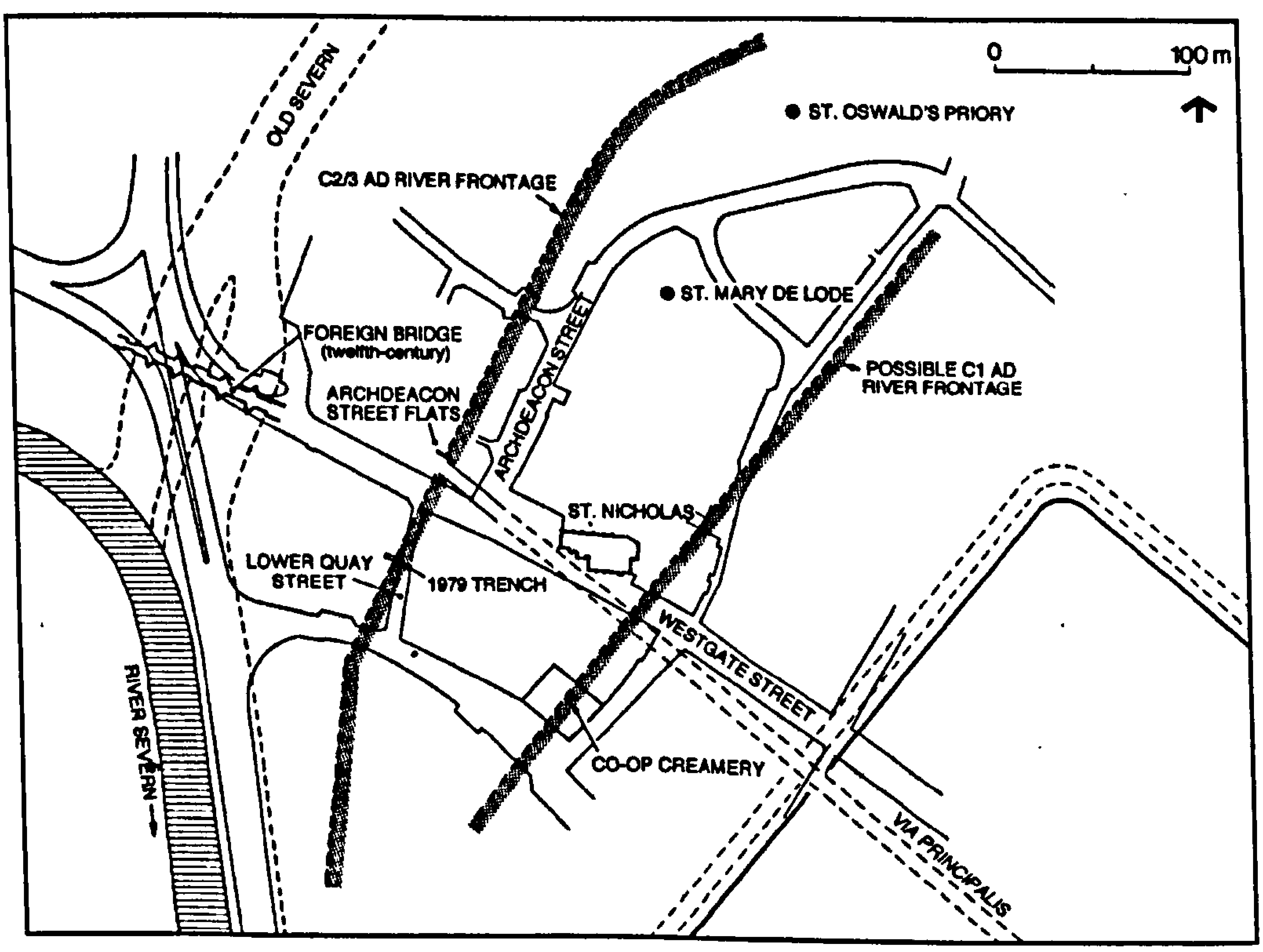


Figure 7.4. Lines of successive waterfronts of Roman and medieval Gloucester (P.Moss)

Wroxeter *(Viroconium)*

Perhaps surprisingly, no waterside structures have been located at this major site on the banks of the River Severn. The area of the probable Roman harbour reported by White (1999, 5) was subjected to further investigation, but no evidence for any surviving structures was found (White 2003. *pers.com.*).

Evidence from other parts of Britannia

London *(Londinium)*

The most extensive information of a Romano-British waterfront has come from the River Thames in London (*Londinium*), where a combination of extensive re-development, the provisions of PPG 16, and the activities of the Museum of London Archaeology Service, have led to a series of developer-funded excavations. These have revealed considerable details of the foundation of the port in the late 1st century, its development in the 2nd and 3rd centuries, and its decline in the 4th century when "after almost two centuries of energetic expansion, Roman London shrank to a small community mainly on the waterfront" (Milne 1985, 22-33).

Figure 7.5. Reconstruction of the early waterfront of Roman London (Museum of London)

At Pudding Lane, some 75 m to the west of the present London Bridge, the remains of a massive timber framework (*Figure* 7.6 - left), were excavated. This was built (c. AD 80) out into the river, presumably supporting a planked platform, and has been interpreted as a landing stage, allowing the transfer of cargoes from ship to shore. It has been suggested that the structure was pre-fabricated, as it had to be erected on an open foreshore between tides. Within a few years, this landing stage was dismantled, as part of a planned development incorporating the construction of quays, terraces and warehouses. The replacement was a timber-faced quay of massive construction (*Figure* 7.6 - right), using timbers of up to 660 x 400mm in cross section, in-filled with dumped deposits and levelled off with a surface of brick-earth and gravel.

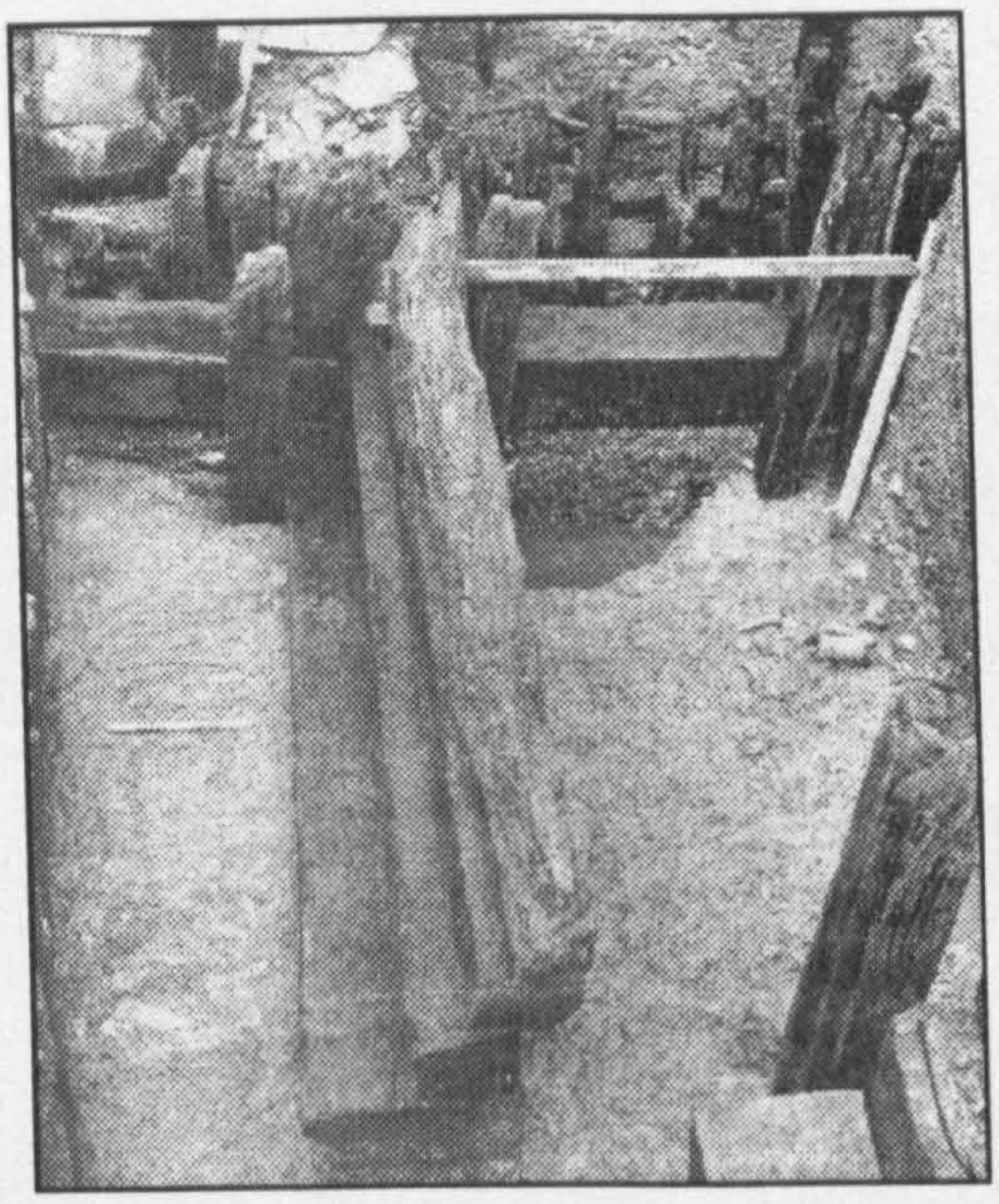
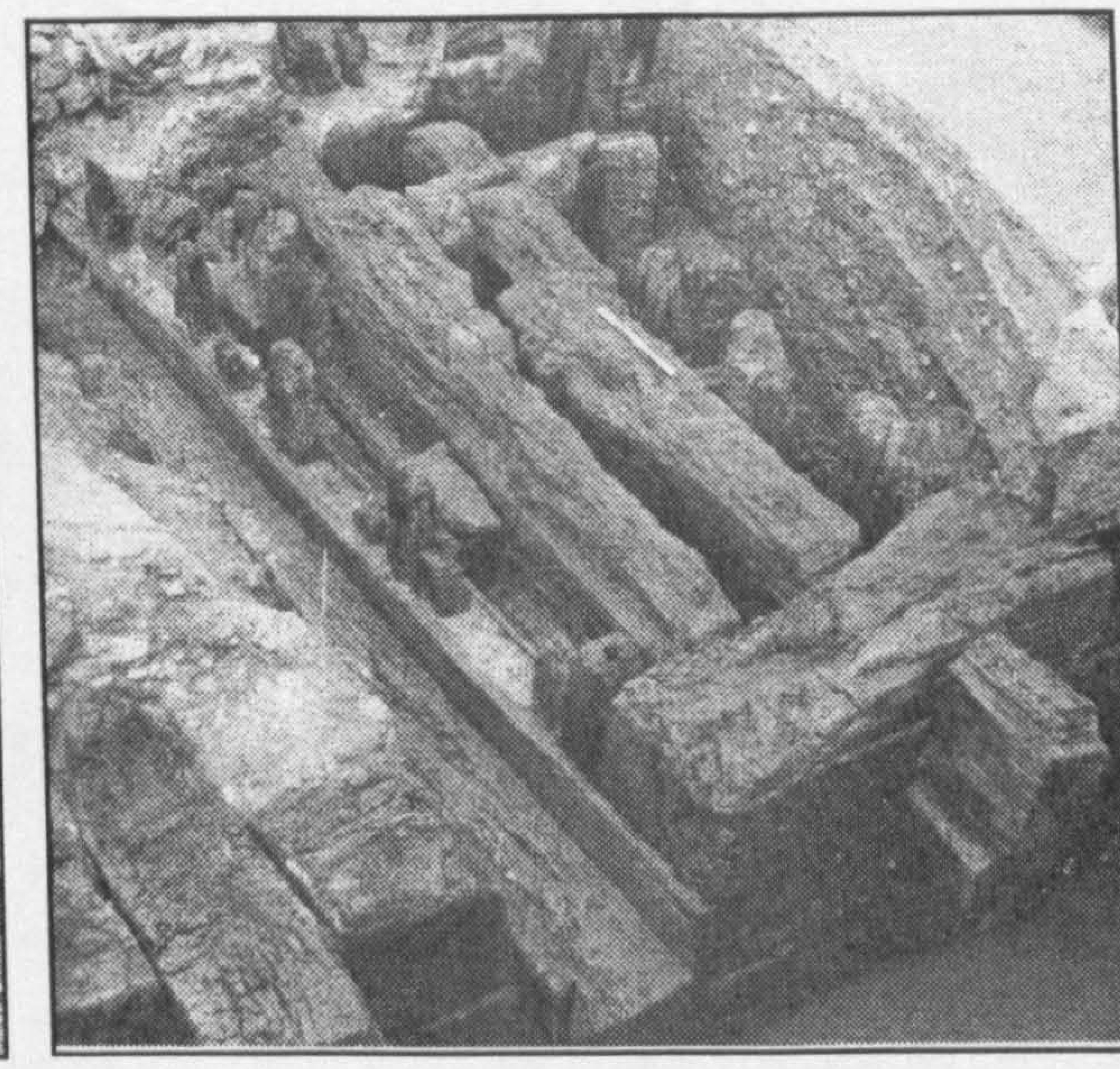
 

Figure 7.6. Left - Braced wall of 1st century openwork landing stage, near present Pudding Lane
Right - Massive timbers of Eastern quay, built over earlier landing stage shown above.
(Museum of London)

Development along the London waterfront continued until the mid 3rd century, with each successive quay being laid at a lower level than its predecessor (*Figure* 2.3), this indication of a fall in the river level was discussed in Chapter 2.

York (Eboracum)

In Britain, the siting of the fortress at York demonstrates that the Roman army was prepared to undertake the movement by water of materials on a massive scale, in order to exploit a location of major strategic advantage. *Eboracum* is located at the confluence of the River Ouse with the smaller River Foss, and lies not far above the conjectured tidal limit in Roman times, some 24 km from the Humber Estuary. The Vale of York provides the only entirely lowland route between the southern and northern areas of Britain, and the site is therefore of considerable military importance and provided a base for the emperors Septimus Severus and Constantius Chlorus, when engaged in military action in Scotland. The original wooden fortress was rebuilt in stone from the early 2nd century onwards (*Figure* 7.7) but, unlike other fortress sites such as Caerleon and Chester, it had one major disadvantage, in that there is no suitable source of building stone for at least 15 km in every direction. Along the rivers, the preferred means of moving heavy materials, the distances are considerably greater. The construction of the fortress employed a wide range of building materials, with sources extending from the Pennine fringe in the West, to the North York Moors and Wolds in the east, along with occasional pieces of more exotic material.

It has been estimated that the reconstruction of the fortress at Chester led to a requirement of 314,128 tonnes of stone (Mason 2002, 95) and, though somewhat smaller, the stone requirement for York would have been in the order of 260,000 tonnes. This quantity, if transported by vehicle, would have required not only some 308,000 wagonloads (800 kg per load), but also the construction of many miles of fully-engineered roads, a large number of oxen and vast quantities of fodder. To use water transport, it would have been necessary to carry out a programme of river improvement and, for example, it is probable that the artificial course of the lowest part of the Derwent was cut during the Roman period, to shorten the route from the Derwent to York by some 14 km, and avoid the difficult currents near Kelpin Pike and the Ouse/Aire confluence (Gaunt & Buckland 2003, 135-143). The possible Roman origins of the Bickers Dyke, Turnbrigg Dyke and the Bishop's Dyke have not been proven, but would obviously have been of considerable advantage in the movement of such quantities of materials.

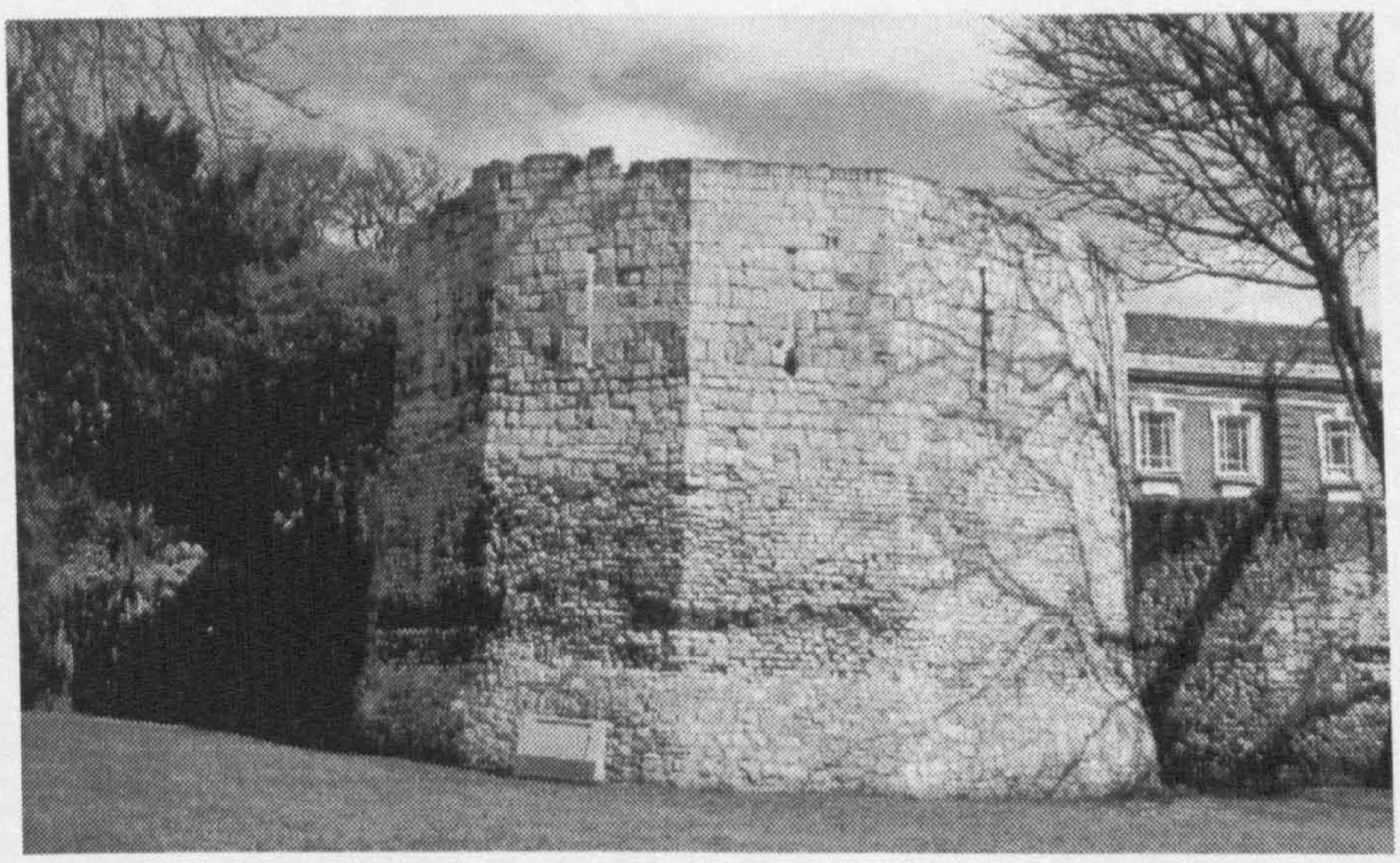


Figure 7.7. The Multi-angular Tower at York, forming part of the western riverfront defences. The upper part of the work is medieval. (de la Bedoyere)

<u>Lincoln (*Lindum*)</u>

The *colonia* at Lincoln lies on the navigable River Whitam, some 60 km from its entry into The Wash and developed, like Gloucester, from a legionary fortress. From Lincoln the Fosse Dyke ran north-west in the direction of Littleborough (*Segelocum*) and the Car Dyke ran south towards Water Newton (*Durobrivae*) and possibly as far as Cambridge (*Duroliponte*), and also connected with the navigable Rivers Welland and Trent. The extent to which these canals were used for navigation, or only drainage, is still a matter of debate. The riverbank was clearly a commercial focus of the city, with a possible dock to the east of the walled town and waterfront building extending for at least a kilometre. Jones considers that substantial quays were not needed, as Lincoln was situated above the normal tidal level, and that wooden jetties, similar to that found at Chester, would have been adequate for the loading and unloading of sea-going vessels (1999, 108).

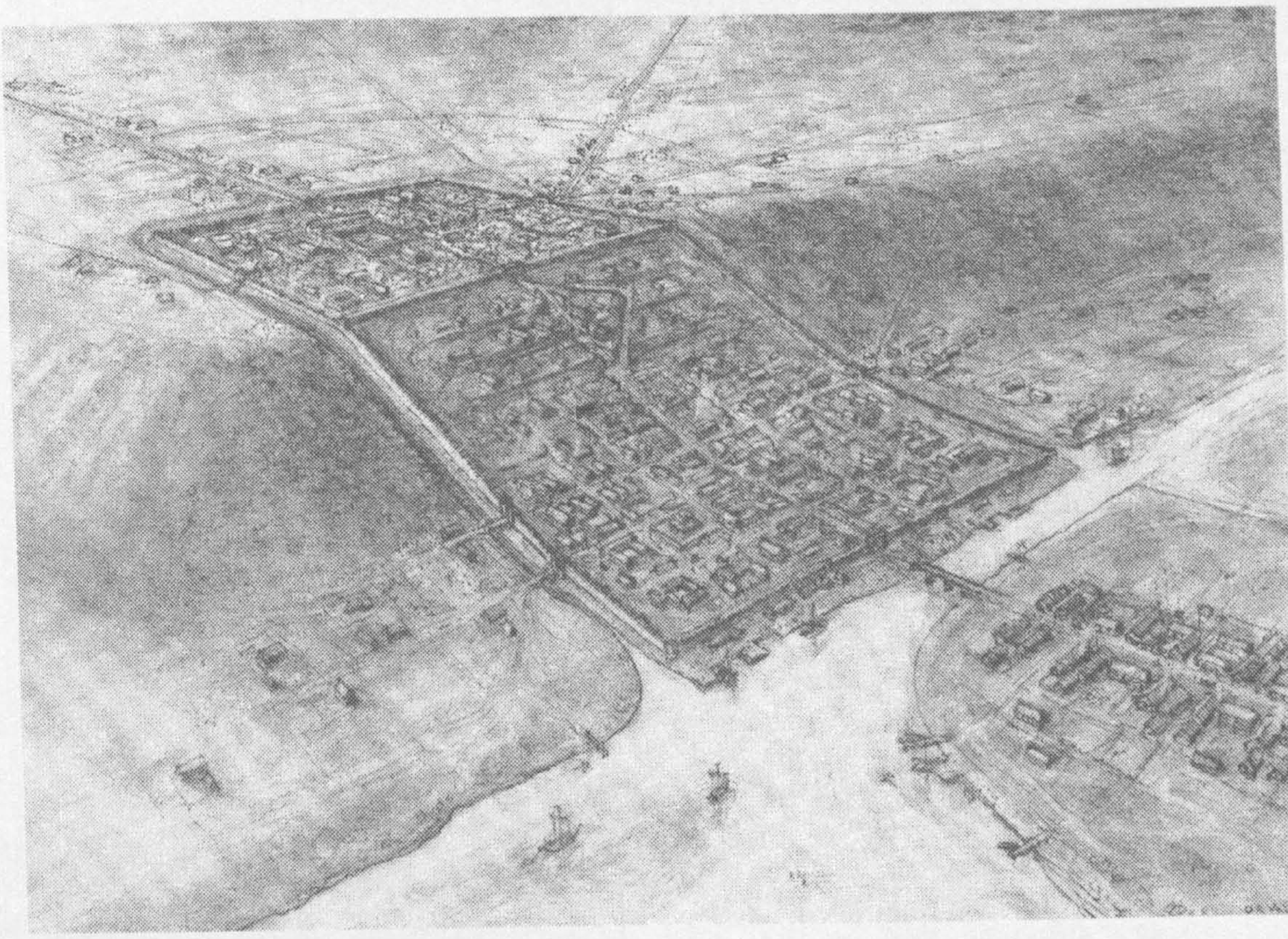


Figure 7.8. Reconstruction of the late Roman city of Lindum, illustrating waterfront activity. (D. Vale)

Dover *(Dubris)*

The construction of the headquarters for the British squadron of the *Classis Britannica* was commenced in AD 116, but was left unfinished, probably because of the demands of the construction of Hadrian's Wall. Work on the construction of second fort, on the levelled remains of the previous structure, began c. AD 130 to an increased size of 1.05 ha, on a similar design to that of a normal auxiliary fort of the period. Rebuilt in AD 160, abandoned again in AD 180 it underwent a final phase of re-furbishment and re-occupation early in the 3rd century and then became disused and probably demolished.

A *pharos* (lighthouse) was built on each of the headlands overlooking the harbour (*Figure* 7.9), and the remains of that on the Eastern Heights still display some 13 m of Roman construction. A protected anchorage at the mouth of the River Dour was formed by the construction of massive breakwater; the remains of 30 m of timber-framing, infilled with shingle being found in 1855, some 230 m to the east of the fort and timber piles, mooring rings and groynes were found in 1860. A probable quay and timber jetty to the west of the inlet were found in 1956, and a structure closer to the mouth of the inlet, located in 1974, has been interpreted as a continuation of the harbourside.

Ilchester *(Lindinis)*

Roman stone quays have been claimed at Ilchester (Cox 1950, 95), and Thew (1994, 134) has found geo-archaeological evidence for the canalisation of the River Yeo during the Roman period. Whilst accepting the evidence for canalisation, Leach (2000, *pers. com.*) considers a medieval date for the quays to be the most likely.

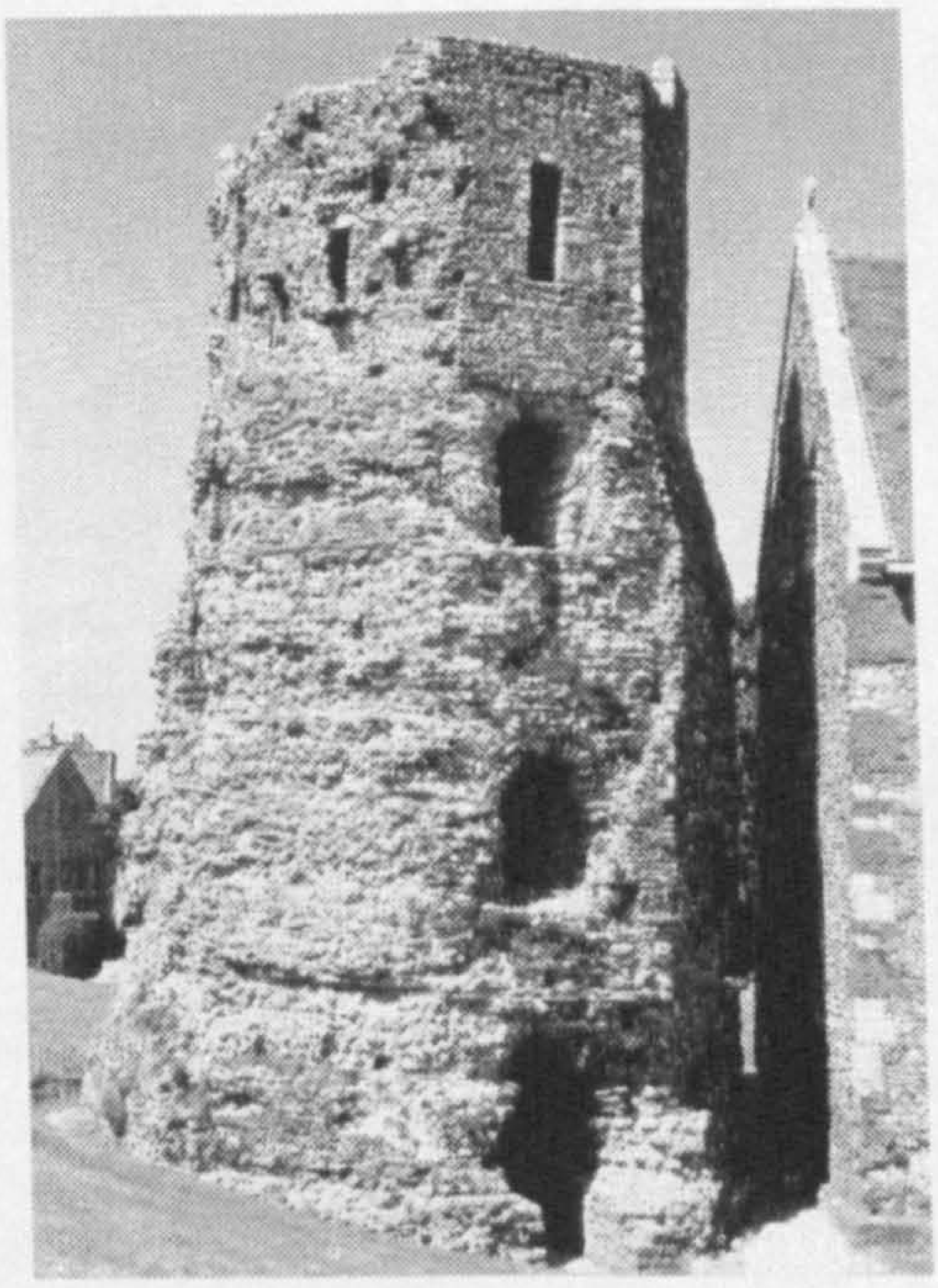
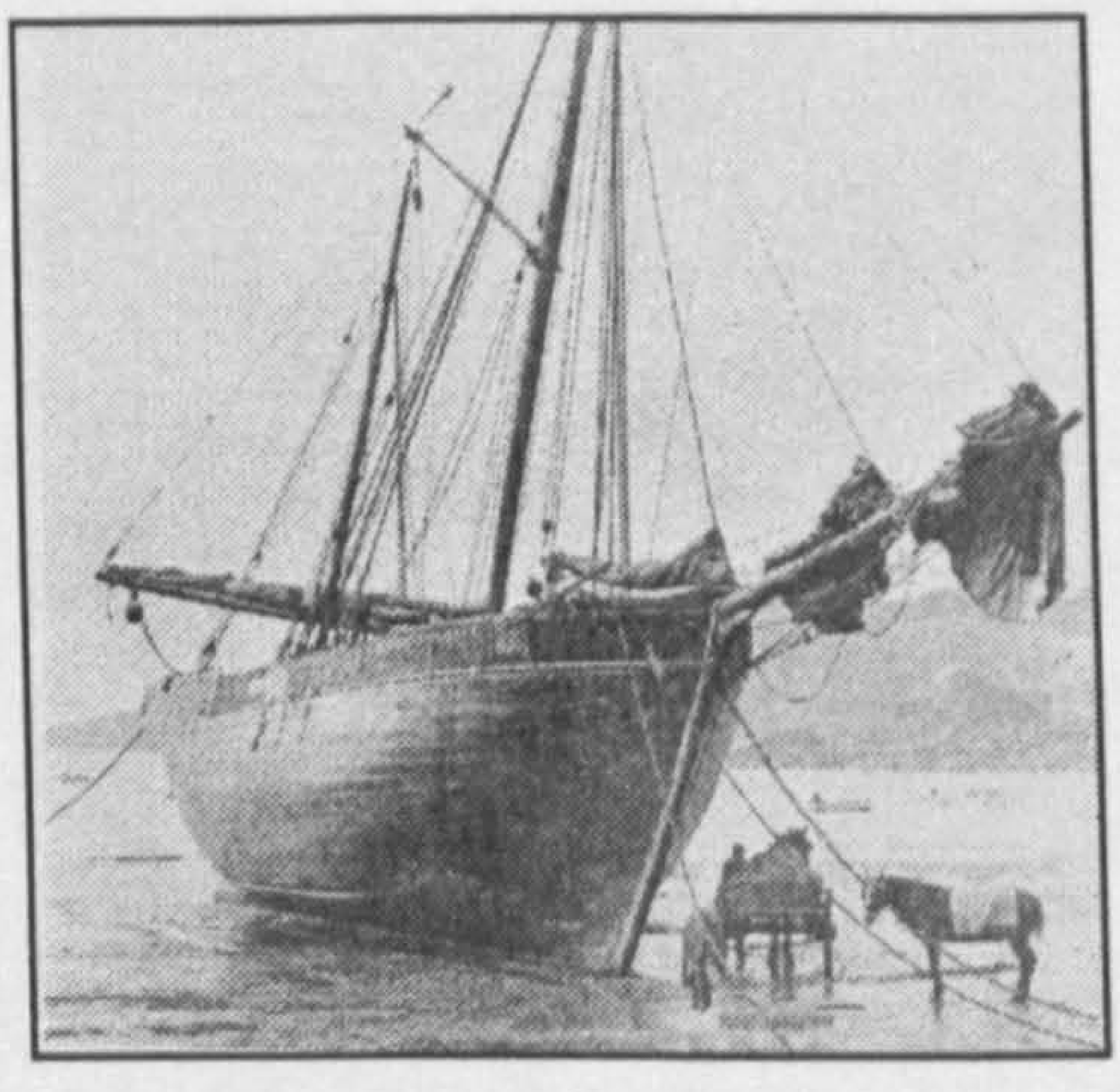


Figure 7.9. The eastern lighthouse at Dover. The lower three-quarters of the structure is Roman, and the upper external masonry is a medieval repair. (Mason)

<u>*Absence of evidence from the archaeological record*</u>

Some methods of unloading leave no trace in the archaeological record, as in the case of beaching, which is achieved by running a vessel aground in shallow water at half-tide (to avoid stranding). At low tide, cargoes were transferred into wagons, as was often the case in recent times at many places in the Bristol Channel. For example, on the Somerset coast, Severn trows frequently beached on the sand at Knightstone Harbour at Weston-super-Mare to bring coal from South Wales (*Figure* 7.10 - right), and a similar manner of unloading was used to supply the isolated limekilns at Kilve. The flat bottom form of the Blackfriars and St Peter Port ships, and the New Guy's Hospital barge, indicate a response to this requirement.



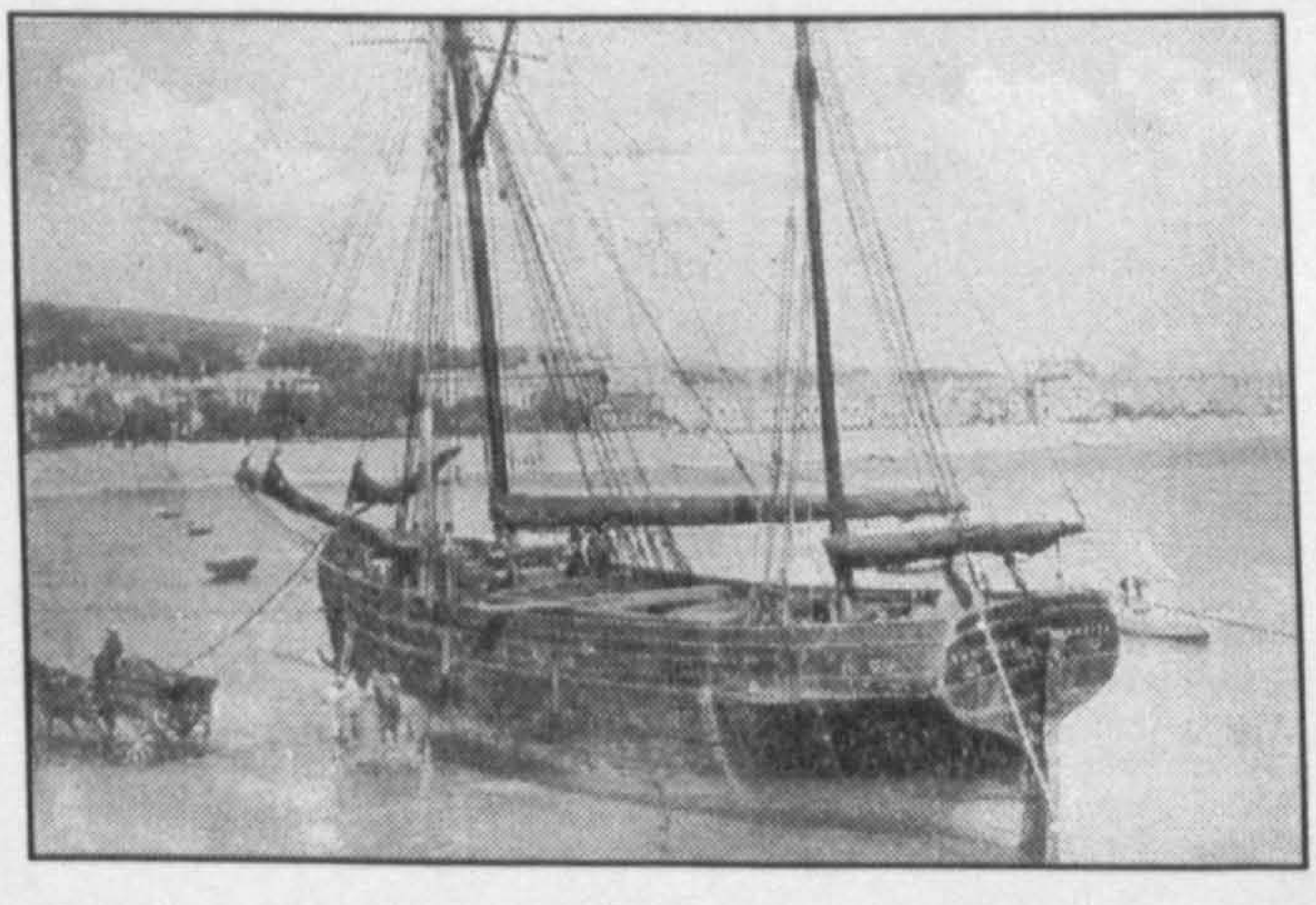


Figure 7.10. Left - The trading ketch "Charlotte" discharging cargo at St Ives c.1908 (Gillis Collection)

Right - Early 20th century photograph of the trow Squirrel beached at Knightstone Harbour, Weston super Mare (Neil Parkhouse collection)

Some substantial structures, such as wooden landing stages, have a limited life and Roman period remains are unlikely to be located, other than at known locations such as Caerleon and Chester. Figure 7.11 shows the remains of a jetty, dating from the late

19th/early 20th century, at Cone Pill, Woolaston (Allen 2000, 132-4). Protected by a previous sequence of deposition, the recent erosion of the riverbank has exposed it to the elements, and it is rapidly disintegrating. There is no evidence of a road leading to the jetty, built for the convenience of one or two local landowners, as was the probable case for riverside settlements in the Roman period.

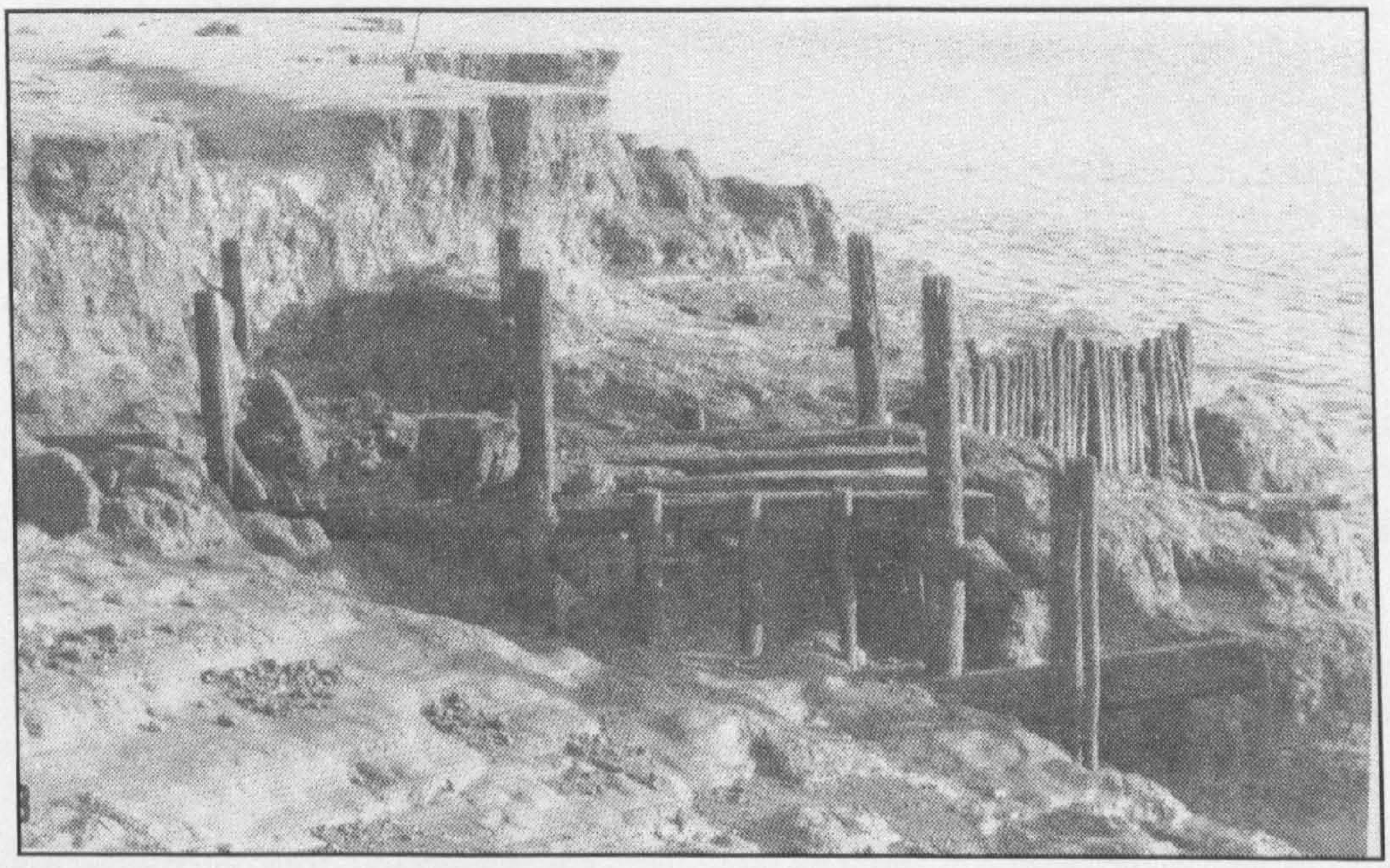


Figure 7.11. Remains of jetty (c. 1900 AD) near the entrance to Cone Pill on the Severn Estuary (J.R.L. Allen)

In some cases the landing facility, at all periods, was even more ephemeral, consisting simply of a gangway or plank, carried on the vessel and placed between ship and riverbank (*Figure* 7.12), and never even entering the archaeological record in the place where used.

Figure 7.12. Portion of a fresco in the Vatican Museum showing a codicaria *being loaded with sacks of corn, by means of a gangplank. (Mansell Collection)*

By considering the Roman road system and its association with known coastal and riverside settlements, Cleere (1978, 36-40) identified the location of 45 possible harbours in Britain, including Sea Mills, Gloucester, Caerwent, Caerleon, Cardiff, Neath, Carmarthen, Pennal, Caernarvon, Caerhun and Chester. His arbitrary division into "military" and "civilian" harbours does not stand up to closer examination, for example, Gloucester was, for the first 20 years, a legionary headquarters and then became a civilian city - the same is true of Wroxeter. Chester retained a military role for most of the Romano-British period, but there can be no doubt that the harbour was also used for non-military shipments.

Evidence from later periods

There is no significant documentary evidence for the use of British rivers during the Roman period. In order that an impression of the potential for navigation may be examined, some varied examples of river use, ranging from the medieval to the mid-18th century, have been chosen to illustrate the diversity and volume of traffic that was possible, even on rivers that are now restricted solely to leisure activities, such as boating and fishing. The period from AD 1500-1750 is of particular importance, as it was the time of river improvement on a significant scale, yet precedes the construction of artificial water-courses during the Canal Age. By AD 1500 the population of England and Wales had risen to some four million, and therefore within the range of estimates for the population of Roman Britain (Millett 1990, 182). As in the Roman period, this rise in population was accompanied by a rise in urbanisation with, for example, the population of London doubling from a quarter of a million inhabitants to half a million, in less than a hundred years. This concentration of population created a problem of supply, to which long distance transport by water was the most effective solution

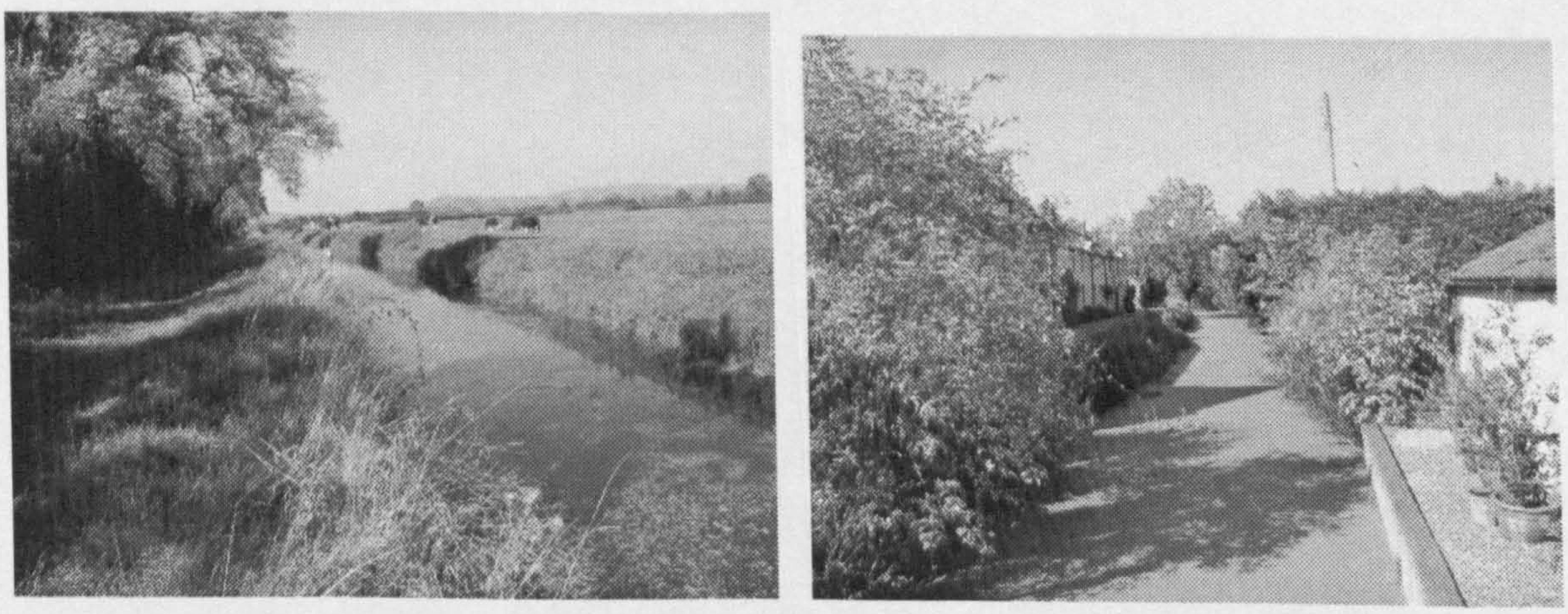
Legal constraints

The earliest legislation applying to navigable rivers refers only to the taking of salmon, or to restrictions on weirs and other hindrances to navigation. The construction of weirs caused conflict of interest by hindering river navigation and in 1215 Magna Carta called for all inland weirs on the Thames and Medway to be removed. Brown points out that, somewhat ironically, the agreement was signed on Runnymede, a small island in the Thames, typical of those used for the construction of fish weirs, as the channels are narrow and shallow. By digging a second channel on the point of a slight inflection in the main channel, it was possible to create islands of this type. An alternative was to dig a bypass channel or "barge-gutter" around the weir and this practice was common on the River Severn resulting in many small, thin islands known as bylets or eyots. A number of these have remained visible, because of the channel stability of the Severn, largely the result of its tall cohesive banks, although the "barge-gutters" have often silted up (1997, 259).

Regulations regarding these matters began to be enforced in 1287, and numerous statutes relating specifically to the removal of weirs, jetties, mills, mill-dams, etc. causing obstructions to boats were passed (Pratt 1912, 121). The first Act for the improvement of an English river was a Statute of 1424 (2 Hen. VI.) that appointed a commission "to survey, redress and amend all those faults of the River Lea". In 1431 Parliament passed an Act for the protection of boatmen in the Severn estuary against "many Welshmen and ill-disposed persons" who " used to assemble in manner of war and stop trows, boats and floats or drags on their way with merchandise to Bristol, Gloucester, Worcester and other places, hewing these craft in pieces, and beating the sailors with intent to force them to hire boats from the said Welshmen". This act declared the Severn a "free river for all the King's subjects to carry on within the stream of the River" (9 Hen. VI. c. 5).

Early post-Roman river improvement

As early as the 10th century there is evidence of the importance placed on artificial canals for the transport of building materials and other bulky commodities to and from monastic sites (Bond, 2001, 102-3), for example, the course of the River Thames at Abingdon underwent a number of alterations during the 11th and 12th centuries (Bond 1979, 61). On the Somerset Levels, the River Brue was diverted away from the Bleadney gap into Meare Pool, the Pilrow Cut (*Figures* 7.13) was an artificial canal linking the Rivers Brue and Axe and thereby providing access to the coastal manors of the Brents, Lympsham and Berrow.



Figures 7.13. Two views of the Pilrow on the Somerset levels, at the village of Mark.

The possibility of a 1.5 km canal connecting Glastonbury with the River Brue during the Abbacy of Dunstan has been discussed by Hollinrake and Hollinrake (1991, 117-8; 1992, 73-94). It is possible that Glastonbury Abbey also constructed a new outlet of the River Brue to the sea near Highbridge (Williams 1970, 62-74). During Edward I's campaign against Llewellyn, from 1277-80, three hundred "ditchers" from the Fenlands were engaged in digging a new cut, 3-4 km long, between Rhuddlan and the sea. This replaced the meandering course of the River Clwyd, and enabled the newly built castle to be supplied by sea-going ships (Taylor 1963, 319).

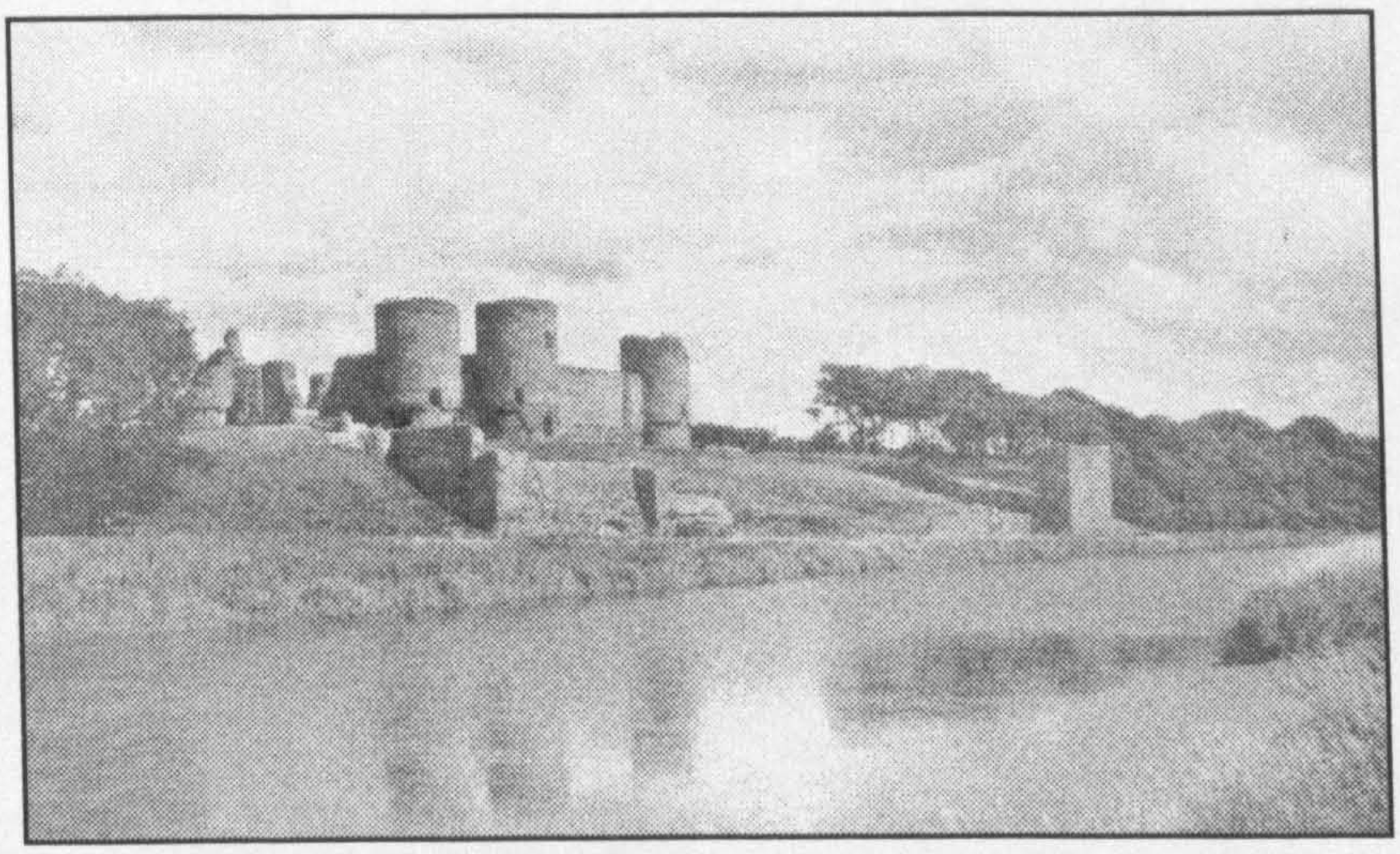


Figure 7.14. The canalised course of the River Clwyd at Rhuddlan Castle. (H.L.V. Fletcher)

In a 13th century document (*Joannis confratis et monachi Glastoniensis)* states that the watercourse between Nyland and Bleadney (*Figures* 7.15) "was adequate for the Abbot to take stone, lime and corn from his manor and from other places in those parts to his Abbey of Glastonbury and [they] were used to go from their Abbey to the manor of Andredsye [Nyland] in their boats."

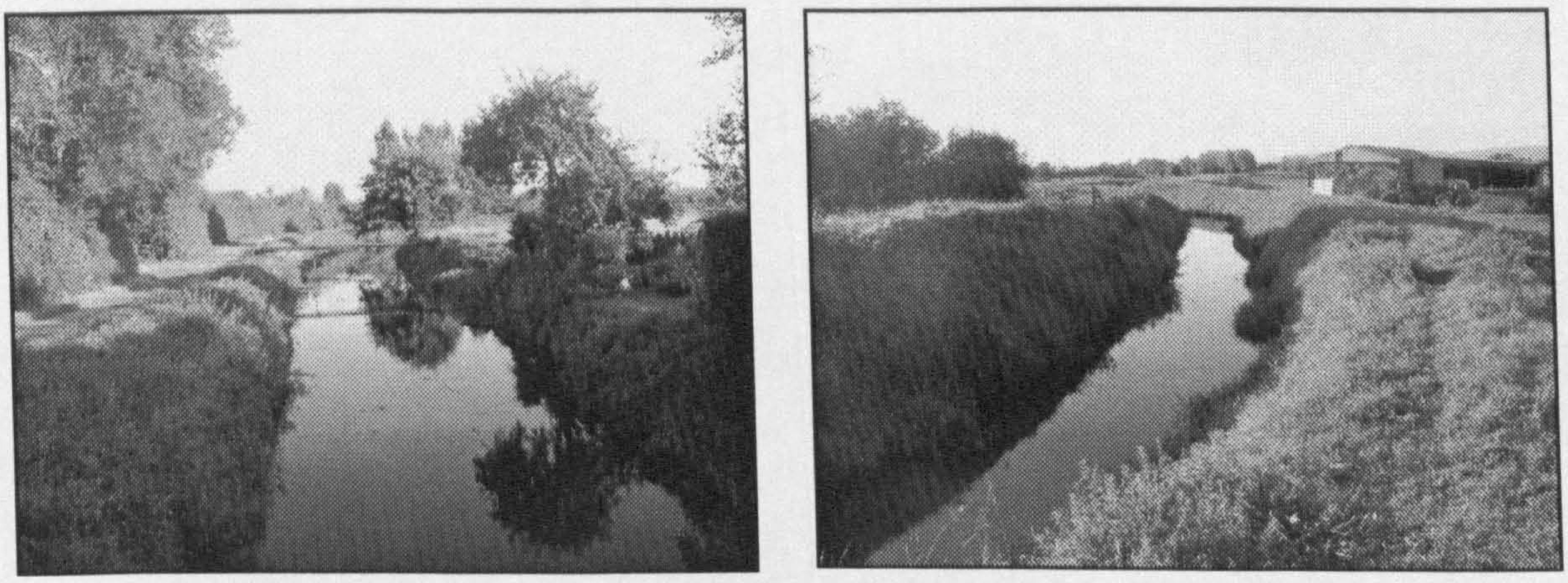


Figure 7.15. The River Axe on the Somerset Levels; on the left near Nyland, on the right at Bleadney.

Transport on the major English rivers 1600-1750

The difference in cost between road and river transport suggests that goods would be carried by water when that was possible and convenient, but river transport leaves very little evidence of its nature and extent. It is therefore difficult to determine how many of the rivers were navigable, and what was the limit of navigation on individual rivers. The five major rivers, the Yorkshire Ouse, the Trent, the Great Ouse, the Thames and the Severn, were all tidal, and therefore passage along them, within the tidal limits, was free and common to all. They were all navigable but, except for the Severn, very little is known about the goods they carried. Willan (1976, 15) considers it doubtful whether even intensive local research would reveal very much about the traffic on some of these rivers, as the absence of tolls removed any incentive to record the passage of goods. Later when the improvement of rivers led to the imposition of tolls to pay for the improvement, records of tolls must have been kept, but they do not survive before the end of the 17th century. Traffic on the Severn is better documented, simply because Gloucester ranked as a seaport and so its trade was recorded in the Port Books.

The Yorkshire Ouse was tidal to York and had been accessible to seagoing ships, and during the early 16th century had been ranked as a seaport. Probably because of the increased size of ships during the 17th century and some deterioration in the river, sea going vessels were prevented from reaching York and the city became purely a river port. It is probable that there was some river traffic between York and Boroughbridge, but neither the Wharfe nor the Aire seem to have carried a significant volume of goods. The citizens of Beverley made some improvements to the Beck, which gave access to the sea via the River Hull. Willan (1976, 16-17) comments that whilst the Trent was clearly an important channel of communication, it seems impossible to get any accurate picture of the traffic on the river. Only one of the Trent's tributaries, the Idle, was navigable but the Foss Dyke, an artificial channel which linked the Trent at Torksey with Lincoln, had been navigable but seems to have deteriorated in the sixteenth century, when attempts to scour it were never completed. However, at times of high water levels, it is possible that travel from York to Lincoln by waterway could have taken place. The Great Ouse was navigable from King's Lynn to St Ives, the Cam is known to have been navigable to Cambridge and there was some traffic on the Little Ouse and the Lark. The Ouse was linked with the Nene at Wisbech; the Nene was navigable to Peterborough. From London, the Thames was navigable by large sailing barges as far as Burcot, where it is probable that transfer took place into smaller river craft. There are very few records of the products that were carried up or down, but Willan (1976,18-19) cites examples of hay, wood, stone, slate and "the occasional shipment of salt fish and wainscot" being unloaded at High Bridge in Oxford and considers that coal must have gone upstream. To the east of London, the Lea was navigable from Ware in Hertfordshire, and a significant trade in malt and corn developed. The port books of Bristol (Exch. K.R. Port Books, 1128/13, 14) show that the port shipped upriver to, for example, Berkeley, Frampton-on-Severn, Newnham, Gloucester, Tewkesbury, Worcester, Bewdley and Bridgnorth. Wine was the most important single item but there is also a record of a wide variety of goods: soap, raisins, linen, canvas, oil, iron, dry-wares, upholstery-wares, tin, brass, pitch, tar, hops and fish. The wine had probably been imported from the Bordeaux region, and the tin came up by coaster from Cornwall. An equally wide variety of goods was sent down river. Tewkesbury and Gloucester shipped large quantities of barley, wheat and peas to Bristol, Bewdley sent skins, tallow, leather and cloth; Bridgnorth wool, honey, candles and wax; Shrewsbury and Bridgnorth sent wool. Tewkesbury, Gatcombe and Gloucester had a coasting trade of their own, and there are records of direct shipment of large quantities of wheat and barley malt to as far as Caernarvonshire, Devon and Cornwall (Willan 1976. 20).

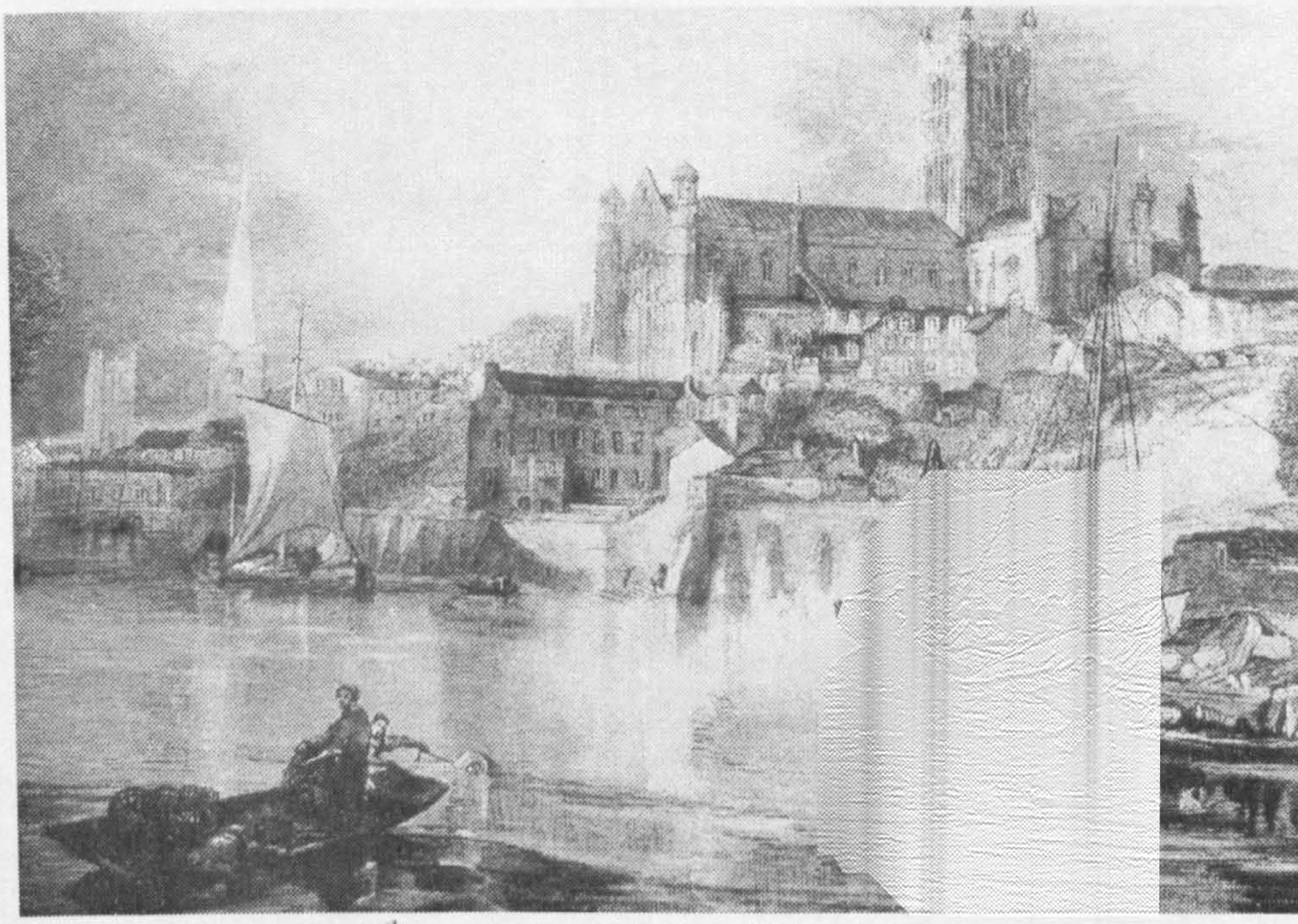


Figure 7.16. Early 19th century engraving by J.M.W.Turner, of vessels at Worcester. (Max Sinclair collection)

Conclusion

The evidence from historical periods demonstrates the extent to which the coasts and rivers of Britain were used for the movement of large and varied volumes of traffic. A combination of sea and inland waterway transport enabled goods to be moved, relatively inexpensively, over long distances. The river improvements that were made during the 17th and 18th centuries were driven purely by the profit motive, and it is therefore clear that an economic case existed for this type of venture. However, the needs of the military are not subject to the same economic constraints; an example of this from the more recent past is the Huntspill River on the Somerset Levels, a completely artificial watercourse, constructed during the Second World War to service the needs of the Royal Ordinance Factory at Puriton. An interesting footnote to this is that the majority of the labour was provided by prisoners of war, echoing what has been suggested for the Romano-British period.

In their assessment of the possibility of water transport to the legionary fortress at Inchtuthil, Pitts and St Joseph (1985, 44-5) considered that navigation of the Tay beyond Perth would not have been a practical proposition "because of the rapids below Stanley, and, in particular, of a barrier of hard rock, the cause of the Falls of Campsie Linn". However, Martin (1992, 18-19) considers this may be a modern viewpoint "conditioned by steam and the internal combustion engine to the notion of cheap and easy land transportation". Pointing out that there is documentary evidence for river transport taking place from the 13th to 19th centuries, he draws attention to a report in the *Scotsman* of 8 April 1816 stating that this part of the Tay (Campsie Linn) "may be passed with a boat in safety when the water is low". Martin goes on to suggest that even when the river was in flood, a short portage "can hardly have represented a serious obstacle to legionary troops seeking to exploit the benefits of river transport from the Tay Estuary to their fortress at the Highland gates".

It is probable that the rivers of Roman Britain were exploited to a greater extent than at any period up to the commencement of the Canal Age. This was made possible by a combination of engineering skills, military necessity, economic advantage, plentiful labour resources, suitable ships and boats and an absence of riparian rights. It is quite clear that the Roman period saw dramatic peaks and troughs in the utilisation of the British rivers and coasts. For example, the Flavian constructions and the Severan reconstructions are at one extreme, and the virtual absence of the legions during the long campaigns in the north, are at the other, and this is further discussed in Chapter 9. Because of the processes of erosion and deposition, coastal and riverside structures are less visible in the archaeological record than those inland, but sufficient remains survive in the study area to indicate the scale of achievement.

Chapter 8. Cargoes and cargo-carrying capacities

Introduction

Parker considered that "The cargo of a ship constitutes a sample of trade goods on their way from one port to another, and so provides a unique kind of evidence about ancient trade" (1992, 3). This chapter will therefore focus on, firstly, the products that needed to be moved and, secondly, the vessel potential for movement by water. The locations to which such movement might take place, whether by sea or inland waterway, are detailed in Appendix 1 (the alternative of movement by land will be considered in the following chapter). Potential cargoes will be discussed, these will be divided into products from within the Province, such as grain, copper, iron and stone, that might be either used internally or exported, and then the products that were certainly imported from overseas sources. Understandably, there will be a concentration on high volume products such as, firstly, grain and then wine, followed by olive oil, which is of particular significance, because the source of supply (Baetica) is known. This will be followed by an assessment of the archaeological evidence, from within *Britannia*, of the cargo-carrying capacity of vessels of the period (the vessels themselves having been considered in Chapter 3), and then by a consideration of the loading factors involved in the cargo-carrying capability. A theoretical model for the type of sea-going craft operating in British waters will then be proposed leading, in Chapter 11, to an assessment of the volume of shipping, broken down into specific periods, over almost four hundred years of Roman rule.

Products of the agricultural landscape

The first 200 years of Roman rule saw the continuation of the agricultural pattern established in the later Iron Age, but a winter, as well as a summer wheat crop, was introduced, having the effect of allowing an increase in the number of livestock kept year round. The introduction of a plough with coulter, share and mould-board provided a better seedbed, obviated cross ploughing, and could be used to break up the heavy clay soils that had resisted earlier attempts at expansion. A number of new or improved plant varieties were introduced, including rye, oats, vetch and flax, as well as cabbage, parsnip, turnip, carrots and other vegetables, and fruit trees such as the vine, plum, apple, mulberry and walnut (Millet 1990, 91-9).

The production of grain

Caesar commented that "the population [of Britain] is very large, their homesteads are thick on the ground and very much like those in Gaul, and the cattle are numerous" (*BGall.* 5. 12) and Strabo referred to the production of grain and cattle, some of which was exported (*Geography* 4. 5.2). Tacitus wrote, "except for olives, vines and other products of warmer countries, the soil will produce good crops. They are slow to ripen, although they shoot up quickly, both facts being due to the same cause, the excessive moisture of the soil and atmosphere"(*Ag.* 11). At the time of the Roman invasion much of the landscape had already been extensively cleared of woodland and converted to agriculture, but there seems to have been some further clearance in the Roman period, presumably to increase the area and available for pasture and cultivation of crops.

The province often produced a significant surplus, as indicated by the account of the interruption of shipments of British grain to the mouth of the Rhine in the mid-4th century; Ammianus Marcellinus records (18. 2,3) that Julian "constructed granaries in place of those burnt, in which could be stored the supply of grain usually brought over from Britain". Libanus states that "In the earlier times corn was shipped from the island, first over the sea and then up the Rhine, but since the barbarians had become a force to be reckoned with, they had blocked its transport and the cargo vessels have long been hauled ashore and had rotted away. A few still plied, but since they discharged their cargo in coastal ports, it was necessary to transport the grain by wagon instead of river, and this was a very expensive affair" (*Oration* 18, 82-3). Occasional importation from overseas is indicated by a large quantity of charred grain, probably comprising a single cargo, found inside a London shop, probably burnt down in AD 60-61, and seeds of plants mixed with the grain indicate that the crop had been growing in the Eastern Mediterranean (Straker 1987, 151-5). Salway considers that this reflects an exceptional bad harvest in Britain that year, as it is otherwise difficult to understand why this consignment had been shipped from such a distant source (1981, 618-20).

Manning (1975, 112-6) challenged the traditional view of a largely pastoral highland zone, arguing in favour of important pockets of arable production in Wales (this was the later case, before reduced transport costs, enabled by the advent of the railways provided a source of cheap grain). Heslop (1987, 117-20) showed that seed assemblages from the north east of England were indicators of a mixed economy, with significant arable components. Manning's view, that the basic demands of an auxiliary unit could be met by the local population being stimulated to move towards a system of surplus grain production, is not shared by Higham and Jones (1975, 16). They point out that evidence from the Solway region indicated that the Roman influence did not involve an accumulation of native settlements around forts, and that the distribution pattern of native sites was primarily dictated by natural and geographical conditions, such as flood-free levels, or altitude.

The valleys and plains of Wales and The Marches may have been capable of satisfying some of the demand for grain for the auxiliary forts. However, the relative ease by which large quantities of cereals from the fertile English lowlands could be transported by water, even to remote garrisons such as Pennal on the coast, or far into the interior as at Forden Gaer, is of considerable importance. Supply of grain from a distance may have been the normal case (see Loughor below), and Bidwell (1997, 85-7) has pointed out that granaries of the supply base at South Shields (*Arbeia*), continued in use throughout most of the last two centuries of Roman rule. He suggests that although forts obtained some grain from the immediate localities, "a supplementary system of long-distance supply was still necessary".

Recent, and well-published, excavations at Caernarfon (Casey & Davies 1993) and Loughor (Marvell & Owen-John 1997) have provided some factual information of the types of grain consumed. The cereal assemblage at *Segontium* (Caernarfon), in North Wales, was dominated by spelt, but with a significant quantity of barley (c. 30%) being present. Bread wheat was present from the mid-late 2nd century, but never seems to have been particularly important. The cereal assemblage from the fort at *Leucarum* (Loughor), on the coast of South Wales, is of a different character, with a high incidence of bread wheat (of non-local provenance) occurring in late 1st/early 2nd century contexts. In this case, the fort's estuarine location, and ready access to a short sea-route for obtaining agricultural supplies from the fertile West Country, were major factors in obtaining imported grain.

Other foodstuffs

The excavated remains of many imported fruits and vegetables, ranging from grapes and dates to cucumbers and coriander, have been found in Romano-British towns and villas (Jones 1981, 97), the wide variety of commodities consumed at Vindolanda, and described in the tablets, is shown in Appendix 6. Significant quantities of oyster shells are found on sites well inland, and speedy transport, packed in casks filled with salt-water and seaweed, would have been necessary for them to arrive in fresh condition. Freshwater fish would also have provided a return cargo, for riverboats transporting inland goods to ports.

Barley for animal feed

From archaeological evidence, a number of mounted units are probable at Leintwardine, Brecon Gaer, Caersws, Forden Gaer, Usk, Trawscoed, Caerhun, and Nantstallon. Each legion had a unit of 120 cavalry, known as the *equites legionis*. An inscription from Caernarfon shows the early garrison was a 500 strong unit of cavalry, the *ala Hispanorum Vettonum civium Romanorum II.*

"Hard" fodder, usually either barley or oats, was provisioned and distributed in a similar manner to wheat for the soldiers. It is probable that Roman cavalry horses were slightly smaller than their modern equivalent, and a reasonable estimate of their requirements is approximately 2.5 kg of hard fodder and around 7 kg of green fodder per day. Whilst a significant part of a horses' dietary requirement could be obtained by grazing, a Roman warhorse needed to be fed some grain in order to remain in good condition (Roth 1999, 62-5). During the Peninsula War, Wellington's mules were given 2.3 kg of barley and 4.5 kg of hay per day and they performed very well on this diet (White 1984, 128-9). Because of their large size, oxen require large quantities of food, and Roth (1999, 66-7) has estimated that this would amount to 7 kg of hard fodder, 11 kg of green fodder or, because oxen can obtain a large percentage of their nutritional requirement through grazing, approximately 22 kg of pasturage.

In a military context, barley is normally considered for use either as animal feed, in brewing or as an emergency/punishment ration, but Davies (1997, 269) suggests that, particularly in the 4th century, at *Segontium*, it could represent locally grown grain "consumed by a garrison long-accustomed to a readily available staple crop". However, the diet of the Roman soldier, even when belonging to a "barbarian" tribe has been considered by van Waateringe to be "composed of all the elements that a true Roman would have expected" (1997, 264).

The ink-written tablets from the fort at Carlisle (*Luguvalium*) were written during the period between AD 72/73 and AD125, when the fort was probably occupied by the *ala Gallorum Sebosiana*, a 500 strong auxiliary cavalry unit. Of particular interest are a series of documents detailing the issues of barley and wheat to the sixteen troops (*turmae*) of 30 cavalrymen and their horses, plus the mounts of headquarters staff, and remounts, say 550. From the documents, Tomlin determined the daily consumption of barley per horse per day as 1.96 kg, an annual total of 715 kg, and therefore a unit consumption of some 392 tonnes per annum (1988, 49).

The demand for wine

We may be surprised at Roman wine consumption, but in *The Ancient Economy* Finley (1973, 206) described Rome as "a fabulous consumer of wine" and, using a combination of both ancient and modern sources, Tchernia set out to test this statement. We have some examples of consumption from the Roman period, for example, Horace suggests that a *sextarius* (0.54 litres) is a reasonable accompaniment to a meal (*Satirae*, I, 1, 74). Suetonius (*Augustus*, 77) describes the Emperor as a "habitually abstemious drinker", never taking more than three drinks of wine-and-water at dinner, in later life his limit was a pint, and if he exceeded this, he would deliberately vomit. By contrast, Martial comments, "one is drunk on ten *quincunces*" (2.27 litres)! Tchernia reached the conclusion that in Rome, the annual consumption per head of the population ranged from 146 litres per annum (if the adult male drank 0.80 litre of wine per day), to 182 litres if he drank 1 litre per day (1986, 21-7).

Diodorus Siculus commented that the Gauls are "exceedingly addicted to the use of wine" and that the merchants, who "transport the wine on navigable rivers by means of boats, and through the level plains on wagons", receive a slave in exchange for a jar of wine, "thereby getting a servant in return for a drink" (5. 26. 2-3).

Wine amphoras in Britain

Amphoras survive well in the archaeological record, but as Parker (1973, 363) has commented, they are only of value in economic analysis, if there is some indication of their place of origin, their likely contents and their date range. In addition to wine, amphoras were used for transporting commodities such as olive oil and fish sauces, and therefore provide an indication of the movement of certain foodstuffs, which were of considerable economic importance, and a significant part of the Roman way of life. The shape of amphoras may well have evolved in response to the need for effective packing, as they can be conveniently stacked in the hold of a ship for transportation, with the spikes of an upper layer fitting securely into the spaces between lower layers.

Dressel 1 and Dressel 2-4 amphoras (30 litres) usually contained wine, produced in Italy, Iberia, central and southern France, and amphoras of these forms are found in pre-Conquest contexts. It seems probable that the main trade routes to Northern Europe were the waterways of the Rhine-Rhone and, to a lesser extent, the Garonne, as shipwrecks on the southern coast of France have provided a large number of amphoras of these types. Some Haltern 70 amphoras (30 litres), found in pre-Flavian contexts, have similar stamps to those on Dressel 20 and suggest manufacture in the same Baetican workshops, but in this case containing wine, rather than olive oil. Rhodian amphoras (25 litres) are found on 1st century AD sites, with the earliest examples from pre-Flavian military sites in southern Britain, where they are the commonest form of wine container and continue to the mid 2nd century AD. Peacock and Williams suggest that the presence of significant quantities of Rhodian wine on British sites was probably due to consignments exacted as tribute, acquired and distributed as part of the *annona militaris* (1986, 62). By the end of the 2nd century the major source of Continental wine importation was the Rhineland, and a lesser quantity was received from Atlantic Gaul. However, for the west of Britain, the more cost-effective Atlantic route should be considered as a viable alternative. Flat based Gauloise 4 wine amphoras (37 litres) are widely distributed in Britain, from the Flavian period and throughout the 2nd and 3rd centuries AD. A series of bas-reliefs and sculptures, along the line of the Rhone-Rhine axis, show this type of amphora loaded on barges, and indicate the principal route to the north. British B4 amphoras (6 litres) probably contained wine from the Eastern Mediterranean and are most common in the 3rd and 4th centuries, with some examples from AD 475-550 being found in western Britain.

Barrels

The use of barrels for the transport of liquids is well known from carvings, but the extent and directions of use are difficult to determine archaeologically. Finds of barrels occur in favourable conditions, but are normally found in conditions of secondary usage, for example, as brine tanks at Droitwich (Woodiwiss 1992, 192-3), and this provides little information about their original function. Wine barrels were often reused as well linings and a number of complete barrels of the 1st to 2nd centuries have been found in London, and it is therefore possible to calculate their weight when full. The empty barrels weighed about 200 kg and the calculated volume would hold 966 litres of wine, weighing 966 kg, giving a total weight when full of about 1200 kg. Another barrel had a capacity of 550 litres and two barrels found at Silchester had capacities of 800 and 930 litres (Marsden 1994, 22). Remains of barrels have also been recovered from Newstead, Colchester, Bar Hill, Caernarvon, Silchester, London and Carlisle; the evidence suggests some were of continental (larch, silver fir) or Mediterranean (cedar) origin, as well as from local sources (oak), and barrels therefore played a significant role in long-distance transportation.

Beer at Vindolanda

In addition to wine, the Vindolanda Tablets show that beer was consumed in some quantity in the *praetorium* of Flavius Cerialis, the garrison commander. For example, on one day four *modii* (a little over thirty litres) was consumed. That the taste for beer was shared by the "other ranks" is epitomized in a letter from the *decurion* Masclus (93/1544), who states that "the comrades have no beer" (*cervasam comilitiones non habunt*) and asks Cerialis "that you order it to be sent" (*quam rogo iubeas mitti*). Birley has calculated that an *as*, the smallest coin in use, would have bought the equivalent of over 11 pints of beer, so the purchase of similar large quantities would have been within the reach of the soldiers of the regiment.

Olive oil

Analysis of the remains of Dressel 20 amphoras from a number of late Iron Age sites in Britain, indicate that significant imports of olive oil, from Iberia, took place prior to the Roman conquest (Williams & Peacock, 1983). This is the most commonly found type of amphora on British sites for the first 200 years of the Roman period (Williams 1987, 273). It has been identified throughout the study, in sites as far apart as Nantstallon and Carvossa in Cornwall, the island of Steep Holm in the Bristol Channel, and Caernarfon and Rhos-on-Sea on the coast of North Wales. In the mid 3rd century Spanish olive oil production declined, or at least ceased to be exported on a large scale. At Vindolanda, only one writing tablet (203) mentions olive oil, by contrast with frequent mentions of wine, beer and a whole variety of spices. However, finds of Dressel 20 amphoras show that olive oil was part of the soldiers' ration (Birley 2002, 92).

In the Mediterranean, the disappearance of Spanish olive oil was mirrored by an increase in a rise of imports from North Africa. In Britain, the remains of amphoras from Tunisia (examples of "North African Cylindrical Amphoras" have been found at Caerwent, Gloucester and Cheddar) are insufficient to compensate for the absence of the Spanish product, and the use of olive oil must have declined during the later Roman period (Tyers 1996, 72).

The province of Baetica, on the south-west coast of Iberia, was the principal source of olive oil, with some 130,000 globular amphorae being shipped each year (Ponsich 1979, 19). Most production sites were located on the Guadalquivir River that followed a meandering, but navigable, course from deep inside the province, to the Atlantic near the Straits of Gibraltar.

This provided an outlet for oil that could be shipped northwards either to Gaul, Britain or into the Mediterranean (Greene 1986, 110). The Dressel 20 is one of the most common, and widely distributed, of all amphoras, especially in the western Roman provinces, with a major axis of distribution to the north west, via the Rhone and the Rhine. However, it will be later argued that the Western Seaways would have provided a more cost-effective distribution route to the study area.

The Dressel 20 is a large globular form, with two handles, with a distinctive plug of clay sealing the base of the vessel. Capacities range from 40 to 80 litres, with an average of 60 to 65 litres. The rim shape developed from more rounded forms in the 1st century, to more angular forms in the 3rd century, it is therefore possible to date the time of production with some degree of accuracy. The vessel is often stamped in relief with a name (often that of the estate owner), set in a rectangular frame on the summit of the handle, painted inscriptions (*tituli picti*) may sometimes be found on the shoulder, between the handles.

On average, a Dressel 20 amphora weighed 28.42 kg and contained 62.83 litres of oil. Since a litre of olive oil weighs 0.91 kg, the average weight of oil in an amphora would be 57.17 kg. As the total weight of an amphora filled with oil would therefore be 84.59 kg, it is clear it would be difficult to lift and carry, even by two men each holding a porters' bar (Peacock & Williams 1986, 52). It is therefore apparent that, whilst small quantities might be unloaded by hand, some form of lifting mechanism was desirable to load and unload a cargo. This could either be a shore-based crane, or by swaying out with a ship's boom.

A 6th century Egyptian papyrus contained a ration scale of an eighth of a pint of oil per day (Jones 1964 III, 191-2). This suggests that a soldier was entitled to 40 pints (23 litres) of olive oil per year, although there is no certainty that this ration was always issued. Assuming that the full ration was taken, the requirement for an auxiliary regiment of 500 soldiers would be 11,500 litres, and 115,000 litres for a full strength legion. Converting these figures to the average capacity of a Dressel 20 amphora gives a demand of 183 and 1830 per annum respectively. Putting these figures into a historical context, the fortress at Caerleon was in use from c. AD 75 to AD 275 (see Appendix 1), with some periods of complete, and other periods of only partial occupation. On the assumption of a 50% occupation over the 200-year period, this suggests the supply of some 180,000 Dressel 20 amphoras, although individual finds do not indicate such quantities. Unfortunately, the report on the excavation of the *canaba* (Evans 2000, 283) includes the following comments. "Given the very high proportion of Baetican olive oil sherds in this collection, it was considered neither useful nor economical of time and money to quantify the number of vessels by weight, or to attempt any statistical analysis of the quantities involved", and "it might also be mentioned that the use of sherds of this class as hardcore might also reflect the relative quantities". It is suggested that these remarks give some substance to the suggestion of the quantities involved. The implications in terms of the shipping involved, at this and other locations, are considered in the Chapter 11.

Products of the extractive industries

The comment that "Britain yields gold, silver and other metals, the fruits of victory" (*Tac.Ag.* 12) is appropriate, as the study area is rich in metalliferous minerals; those mentioned by Tacitus, plus copper, lead and iron. There are major deposits of these materials, as well as widespread and plentiful locations for stone-quarrying, clays suitable for the manufacture production of pottery, and sources of high quality brine for the production of salt. The speed of Roman exploitation and export of these resources is illustrated by a sample from a lead cistern, buried in the eruption of Vesuvius in AD 79 that, according to isotope analysis, was exported from the Mendips, where lead had been mined by the Romans for at least 30 years (Brill & Wampler 1967, 63-77). The movement by water of the products of these industries would have presented a cost-effective alternative to carriage by land, and there can be little doubt that, during the Romano-British period, a thriving system of sea and river transport existed. It is probable that mineral resources were under state control in the Roman Empire, and the army may have been involved in the initial exploitation of newly conquered provinces but, following consolidation, the mines were not were worked directly by the state, but by comparatively small-scale leaseholders. Some areas were placed under the control of a *procurator metallorum*, who regulated mining activities and supervised the workings of individuals and companies and this was probably the case at Caernarfon.

Lead

Pliny the Elder (NH 34, 17. 164) commented, "Lead is used for pipes and sheets. In Spain and throughout the whole of Gaul it is extracted with considerable effort; in Britain, however, it is so abundant within the upper layers of the earth that there is a law forbidding its production beyond a certain amount". There is little evidence in Britain for the use of this metal during the Iron Age, for example, a few lead net sinkers and spindle whorls from the Lake Villages near Glastonbury (Bulleid & Gray 1911, 241). By contrast, the Roman world made great use of lead, particularly for plumbing, and it is probable that this was the only major metal industry introduced into Britain following the conquest (Manning 1979, 113). The extraction of lead during the Roman period, on both large and small scales, is archaeologically demonstrated throughout the study area. As the ownership of all mineral resources was vested in the Emperor, the early extraction was probably organised and supervised by Roman troops, possibly with the use of slave labour.

The Bishops Castle-Montgomery area on the Shropshire/Clwyd border was a significant mining area. Lead ingots of Hadrianic date are known from the vicinity of the "villa" at Linley, and extensive areas of the hillside give indications of hydraulic sluicing. The nearby fort at Brompton has evidence of secondary industrial activity within the fort itself, with bowl furnaces and clay hearths with charcoal and furnace debris, together with pits containing considerable quantities of litharge from cupellation. To the east of the fort, the *vicus* had a dense concentration of industrial pits and gullies yielding iron-smithing slags, hearth bottom material and lead waste, and this leads to the conclusion that the fort was a processing plant for the ore obtained from Linley. On the Mendips in Somerset, the fort at Charterhouse had only a limited existence; with a lead ingot bearing the stamp of the 2nd Legion indicating that the mines were initially under military control. However, a lead pig dated AD 60 is marked "from the lead-silver works of *C. Nipius Ascanius*" making it clear that the control soon passed to private lessees (Webster 1953, 8-9, 22-24). Mendip lead was mined partly for its silver content of 0.04%, extracted by the cupellation process (Elkington 1976, 183-199, 230-234) but by contrast, the mines of Laurion, in Greece, exploited by the Romans to the point of destruction, contained around 1.8% silver content. The last securely datable ingots from Charterhouse, (now in Taunton Museum) were made between AD 164 and AD169, but coin finds indicate that occupation of the settlement, and presumably the working of the mines, continued into the 4th century. There are known lead-mining settlements at Prestatyn (Blockley 1989b) on the North Wales coast, Pentre Flint (O'Leary *et al.* 1989) on the Dee Estuary and Ffridd (Blockley 1989a, 135-66) to the north-west of Wrexham. All three have produced evidence for large-scale ore processing, dating from the later 1st century AD, with each site being provided with a bathhouse. In South Wales, lead was mined at Risca on the River Ebbw, where a bathhouse is also known, whilst on the River Rhymey at Lower Machen there is extensive evidence of lead ore and slag, and at Draethen 1st century pottery and coins have been found at the gallery mine at Coed Cefn Pwll-Du (Nash-Williams 1939a, 108-10).

There is some archaeological evidence for both inter-provincial movement, and overseas export, of British lead. Excavations on the River Frome at Wadebridge Street, Bristol uncovered two large Roman lead pigs with inscriptions dating from the reign of the emperor Antoninus Pius (AD 139-161). It is probable that the pigs fell from a vehicle transporting them across the Frome, probably en route to *Abonae* (Sea Mills), and then on to South Wales. Mention has already been made of the lead ingot, mined and smelted in Flintshire, and found alongside a jetty at Chester. A find of twenty lead pigs at Runcorn, Cheshire, and six pewter ingots found near Battersea Bridge on the River Thames, may be the result of shipwrecks. Analysis of the London ingots show that the tin content was probably mined in Cornwall, and the lead content probably originated from the Mendips. Overseas export is indicated by ingots of British lead found at Lillebonne, Normandy and St-Valery-sur-Somme near Boulogne; stamps on ingots from Narbonne, in southwestern Gaul, imply that the port acted as an intermediary for supplies from Britain, en route to Italy and the Mediterranean.

Copper

There is clear evidence for copper mining at Llanymynech, but the proximity to the so-called siege works at Abertanant and the "supply base" at Llantsantfraid, led Jones (1988, 417-9) to suggest an association with the "last stand" of Caractacus. An alternative view is the direct association of a military presence with mineral extraction, as is evidenced at both nearby Brompton, and further afield at Charterhouse-on-Mendip and Dolaucothi. The discovery of several copper ingots stamped with Imperial numbers may indicate mining on the coast at Parys Mountain on Anglesey, and on the Great Orme (Murphy 2002, 55-7). The abandoned mining settlement at Dylife is close to the isolated fortlet at Pen-y-Crocbren, and is reputed to be associated with Roman mining, and possible evidence for extraction from the Plymlimon foothills has been found at Cwm Ystwyth and Trefeglwys. There are undoubtedly many other sites of Roman period extraction for which the evidence has been obscured or eradicated by multi-period activity ranging from the early medieval to the early 20th century.

Tin

Writing in the 1st century BC and probably basing his observations on information from the voyage of Pytheas (see Chapter 9), Diodorus Siculus (5.22) commented that "In Britain the inhabitants of a promontory called Belerion are particularly friendly to strangers and have become civilised through contacts with merchants from foreign parts. They prepare the tin, working the ground in which it is produced very carefully. They beat the metal into masses shaped like *astragali* (knucklebones) and carry it to a certain island of Britain called Ictis, for at the time of the ebb tide the space between the island and the mainland becomes dry and they can take the tin in large quantities over to the island on their wagons. On the island of Ictis the merchants purchase the tin of the natives.. ..whence it is then taken to Gaul and overland to the Mediterranean." As Belerion can be identified with Cornwall, either St Michael's Mount or Mount Batten (in Plymouth Sound), is probably the site of Ictis (Frere 1978, 30).

There is little evidence for tin mining during the Roman period, but Jones and Mattingly (1990, 181) mention dispersed tin streaming; Isaac (1976, 62) states that after activity in the 1st century AD, the industry was abandoned by AD 100 AD, and "not revived until after AD 250". He cites a hoard at Carhayes as evidence for "the use of water transport in carrying the tin to its wider markets". It is probable that one of the functions for the unusually small fort at Nantstallon was to control the local mineral resources, where there is significant evidence of metalworking within the fort (Fox and Ravenhill 1972, 110). Tin bearing lodes are known from Mulberry, near to Nanstallon and there is some evidence for native tin working. For example, excavation at Killegrew Round revealed an "unusual hour-glass-shaped furnace containing rich slag" and part of a 95% pure, hand-beaten plaque of tin was also found (*Britannia* 1998 29, 423)

Precious metals

There is evidence of the extraction and processing of gold (notably at Dolaucothi), and the de-silvering of lead on Mendip, but these commodities are unlikely to have been locally transported by water, as the weights were small and the value considerable.

Iron

As an illustration of the Roman expansion of the iron industry, Tylecote (1976, 53) has said, "Whereas the amount of slag found on pre-Roman iron smelting sites is measured in kilograms or hundreds of kilograms, the slag heaps on the Roman period are measurable in hundreds of tonnes." In the Forest of Dean, the site tips were so large that, in the 16th and 17th centuries, re-mining them became a commercial undertaking. Near to the small town of *Ariconium* (Weston-under-Penyard), the slag tips covered 200 acres, compared with the largest example from the Weald, which covered 7 acres (Dark 1996, 11). Manning (1979, 117) has suggested that the increase in the Roman period was achieved, not by new mining techniques, but by greatly increasing the number of mines, of types so simple "that a Neolithic miner would have regarded them as amateurish".

A number of iron-making sites have been located along both banks of the Severn Estuary where the spread of slags are limited, and, with the exception of the Chesters (below), at these locations there is little or no evidence for any masonry buildings. Sites of this kind extend as far as Oldbury-on-Severn on the south bank to Rumney Great Wharf on the north bank. The proximity of the river suggests that the iron was probably moved by water, perhaps upstream along the river Severn, to sites such as Worcester where there is clear evidence of iron working (Burnham & Wacher 1990, 232). The Romano-Celtic temple complex at Lydney Park lies at the southern end of the ore-bearing strata, 4.5 km north of The Chesters. The 1928-29 excavations conducted by Dr Mortimer and Mrs Wheeler indicated that, commencing in the 2nd century, the pre- existing Iron Age mines were exploited and that this activity continued into the 4th century. The Roman villa near to the banks of the River Severn, at Woolaston in the Forest of Dean, was excavated by Scott-Garrett in 1938. Fulford and Allen investigated the site of an enclosure close to the villa from 1988-90 and these excavations revealed two furnace sites, with geophysics indicating the probability of other furnaces in the immediate area. There is evidence of a highly organised enterprise for the production of iron blooms, covering an area of about 7250 square metres. Based on the accumulation of waste in the area, the excavators estimate an annual output of between 0.6 and 1.8 tonnes. The working of the blooms into billets probably took place near to Ley Pill and the iron was shipped in billet form, rather than as finished articles (1992, 159-215).

The traffic along the western sea ways implies that a proportion of the production of the Forest of Dean served Imperial needs, but unlike the Wealden industry where the *Classis Britannica* played a significant role, the re-interpretation of the inscription on the Lydney temple mosaic, means that there is no direct evidence of any military or imperial involvement in the organisation of the Forest of Dean industry (Fulford & Allen 1992, 199).

Roman iron-working on the Blackdown Hills, the Bredon Hills and on Exmoor has long been suspected; a site at Burcombe is known as the "Roman Lode", but the problem of identification is that later mining of the same ore body often destroys the evidence. Recent investigation of associated charcoal from a slag heap at Sindercome, south of Twitchen, has given a radio carbon date of 170 BC - 75 AD, and there is sufficient evidence from coins and pottery to indicate significant Roman exploitation of the iron bearing lodes (Riley & Wilson-North 2001, 79-81). Distribution of Exmoor iron "may have been achieved through ports or anchorages on the Taw estuary or Combe Martin Bay" (Holbrook 2001, 153).

Some indication of the demand for iron is provided by Shirley's estimate that 12 tonnes of iron (requiring 72 tonnes of ore) would have been needed to produce the Inchtuthil hoard of 875,000 to one million nails. The fortress also needed iron furniture for its c. 3,000 doors (2001, 107-8). In a civilian context, the extent of iron working at the small town of Worcester is indicated by the fact that many of the streets were surfaced with iron slag (Burnham and Wacher 1990, 234).

Salt

Droitwich

Droitwich lies on the River Salwarpe, not far from its junction with the Severn, and Roman roads from Metchley, Gloucester, Alcester and possibly Wroxeter met here. Salt was a product of considerable economic value in the Roman Empire; its extraction was often carried out under Imperial control. This probably led to the decision to place a fort on the River Salwarpe at Droitwich, on a commanding position at Dodderhill, overlooking the river valley and close to the main road junction, and therefore in an ideal position to supervise the local labour engaged in the industrial process. The brine springs were used in the Iron Age, and it was probably this industrial basis that led to the foundation and growth of the Roman town.

Droitwich brine is saturated at about 25% sodium chloride and will therefore produce 3 kg of salt from 1 litre of brine. By comparison with the Somerset Levels, the same amount of seawater will produce only about 0.03 kg, and the economic advantages of the Droitwich area are therefore immediately apparent. As opposed to seawater, Droitwich brine also contains very few impurities and does not require further refinement. Large quantities of timber are needed for the production of salt by the open pan method, this requirement was presumably satisfied by the establishment of managed woodlands. Salt, being soluble, leaves no trace in the archaeological record and the pattern of distribution is solely dependent on the evidence from briquetage (the coarse pottery used in the production process), and it has been suggested that special ceramic vessels were made in the Malvern potteries, as containers for the salt produced at Droitwich, but this has, as yet, been subject to only limited investigation (Woodiwiss 1992, 183-6).

Land routes for packhorses, known as "saltways" formed an extensive network, but during the Roman period, it is probable that the River Salwarpe was improved to enable access to the Severn. The trade in salt continued to the end of the 19th century and salt was shipped from Droitwich both upriver, and to many ports in the Bristol Channel in special trows that were known as "Wich" barges.

Somerset Levels

There is evidence for the existence of a significant salt-production industry in the Central Somerset Levels, briquetage mounds were first recorded in the early 19th century, and 169 sites have been identified, mostly in the area of Gold Corner and the River Gripps. A section through the upper part of the alluvial sequence is provided by the modern Huntspill Cut and 16 briquetage mounds, buried at depths of 0.3-0.6 m below the present ground surface, have been recorded. The mounds extend westward for some 2 km beyond the area where they survive as earthworks; their burial may reflect the extent of the late/post-Roman inundation and indicate that significant remains of the industry are present below the level of the Clay Belt. Concentrations of Roman material in Highbridge probably indicate salt production on the banks of the proto-Brue river (Rippon 1997, 66-71). Salt production, as with other extractive industries, was under Imperial control, and this would give strength to the suggestion for the possible location of a fort on the River Parrett near Bridgwater (Manning 1976, 26).

In the Bristol Channel, salt production appears to have been restricted to the area of the Somerset Levels south of the River Siger. No salterns have been recorded outside that area, and no briquetage was found during careful excavation at Rumney Great Wharf (Fulford et al., 1994) and Kenn Moor (Rippon, 1994a, 1995b). One possible explanation offered by Rippon (1997, 69) for the lack of salt production at other sites may be muddy water and low salinity in the middle/inner estuary, though he considers that cultural factors were probably more important.

Stone

The enormous volumes of material needed for the construction, and periodic reconstructions, of forts and fortresses led to periodic fluctuations in the volume of shipping. Construction was aided by the fact that building stone was readily available in most of the study area, and because of estuarine or riverine siting, sand, pebbles and cobbles were often locally available. This is in marked contrast to the North Sea coasts where the construction of the "Saxon Shore" forts in the later 2nd and 3rd centuries required the transport of stone over considerable distances (Allen & Fulford 1999, 163-84). This was also the case with the building of the walls of *Londinium* in the early 3rd century, where Marsden (1980, 126-7) has estimated that

35,000 cubic metres of stone were used in the construction of the wall. This would have needed 1,750 voyages, by ships of similar size to the Blackfriars ship, to bring about 45,000 tonnes of ragstone from the source, some 112 km away at Allington on the west bank of the Medway (see Chapter 3). A number of pieces of architectural stonework, carved from oolitic limestone, have been found, dating mainly from the early 3rd century and the stone has been provenanced to Roman quarries close to the rivers Welland and Nene. In view of the considerable quantity, size and weight (from 0.122 up to 0.869 tonnes), transport by road is unlikely and it is probable that the stone blocks were taken downstream by barge for loading onto sea-going vessels for shipment to London (Marsden 1994, 23).

In the study area, the oolitic limestone quarried on the Downs to the south of Bath was in great demand, because of its suitability for fine carving and architectural detail, for example, at Caerleon the columns and column bases of the basilica were executed in this material (Blagg 2000, 142). It was widely distributed throughout southern Britain and was used to the south and east at London, Colchester, Silchester; in the Cotswolds at Cirencester and numerous villas, in the Marches at Kenchester and Wroxeter, in the north at Caernarfon and Chester, as well as at the forts and villas of south Wales. Because of the very considerable quantities and weight involved (a cubic metre block of limestone weighs 2.4 tonnes [Marsden 1994, 23]), it is probable that the stone was shipped on barges down the Avon to Sea Mills (*Abonae*) and then loaded into sea-going vessels for dispatch to its final destination.

At Chester, shipping of stone both in and out of the port is demonstrated by the amount of Welsh slate in stratified Roman contexts, identified as originating at quarries near Caernarfon, and traffic in the opposite direction has been shown by Cheshire sandstone columns found at Caernarfon. Building materials were brought to Caerhun by sea and river, as demonstrated by a sandstone column from Bodysgallen, near Llandudno, a sandstone base originating from Runcorn in Cheshire, and a plinth from the angle of the West Gate identified as having been quarried at Tattenhall, also in Cheshire. Oolitic limestone was shipped from the Cotswolds and used for columns and architectural detail at Kenchester on the River Wye.

Stone from local sources was used when available, for example, the Corinthian capitals and columns of the *forum-basilica* at Caerwent were made from Sudbrook sandstone. At Loughor, limestone, Millstone Grit and Pennant Sandstone were locally available and were used throughout the fort, sand for mortar and cobbles and gravel for the roads and foundations were obtainable from the nearby beaches.

Mason (1996, 91-7) has produced data estimating and summarising the quantities required for the fortress at Chester. The building of the Flavian fortress during the AD 70s presented the greatest challenge, as the construction took place on a "greenfield" site, without the benefit of an existing transport infrastructure, and is summarised herewith. However, it is probable that as part of the original construction, only the baths (requiring 25,000 tonnes of stone) were built of masonry and concrete, and all other buildings would have been constructed of timber on stone foundations. At Caerleon, the situation would have been similar, with the Old Red Sandstone outcropping beside the tidal River Usk, just downstream of the site, and this is the predominant stone in structures of all phases of the fortress. The most locally available freestone was the Sudbrook Sandstone, with a coastal outcrop at Sudbrook near Caldicot, Gwent, with thick beds of the stone forming a low cliff (about 5 m high) around the site of the Iron Age promontory Fort. It would have been convenient for the flat-bottomed boats of the period (see Chapter 3) to "take the ground" before high water, be loaded with stone, floated on the next incoming tide, and then taken by sea and river the 30 km or so to Caerleon. The construction of the legionary baths would have required large quantities of lime, necessary for the original concrete construction, and the Liassic Limestone, outcropping on a limited scale at Goldcliff (8 km south of the fortress), and more extensively in the sea-cliffs between Penarth and Southerndown, could well have provided the quantities required, being loaded onto vessels for transport along the South Wales coast and up the River Usk.

Finds from the brick and tile depot at Holt indicate that it was not established until the rebuilding of the fort in stone at the beginning of the 2nd century and therefore would not have been available for the required production of the 70,000 bricks and 73,000 roof tiles (Mason 2002, 91). The options are therefore the construction of a tilery on site, land transport from established tileries in the south by some 2100 wagonloads, from perhaps Wroxeter or further south, or by sea in vessels of the Blackfriars 1 or St Peter Port type, with probable cargoes of 50 tonnes and therefore some 35 voyages. Although we have no evidence as to which alternative was employed, it does seem probable that, as the necessary raw materials were available on site, that the most likely was production by a tilery specially constructed on site.

Timber

On palynological evidence, Hanson (1978a, 293-305; 1996, 354-60) and Dumayne (1994, 217-224) disagree as to the extent of forest clearance, in northern Britain, during the Roman period. However, both agree that because of the high cost of transport, timber would, wherever possible, be obtained locally and also agree that local sources would usually be sufficient to meet the demand. Hanson estimates the total requirement for a timber fort (palisade, gates, towers and internal buildings) as 22,000 cubic feet (662 cubic metres) and that to obtain this volume of structural timber would require felling of an area between 16 and 30 acres (between 6.5 hectares and 12 hectares). Elizabeth Shirley has suggested that about 70,000 trees needed to be felled to provide the variously sawn timber lengths used in the construction of the legionary fortress at Inchtuthil. She also estimates that 36,000 tonnes of timber (2,000 for ironworking; 2,800 for lime-burning and 31,000 for tile kilns) would be needed to produce basic building materials for a timber-phase fortress (2001, 106-7).

Hanson's comment that, in a newly subjugated area, timber would not "be hauled any further than was absolutely necessary"(*ibid.* 297-8), invites the question as to whether local felling and planking was <u>always</u> employed. As all permanent British fortresses were located on either an estuary or a navigable river, and this was also the case for many of the forts of the study area (see Appendix 1), it is probable that water transport was employed. Timber could then be felled and processed in a secure rearward area (for example, the Forest of Dean), and then shipped direct to the fort, ensuring a much earlier operational readiness, and enabling the garrisons to undertake a military, rather than a constructional role.

<u>Coal</u>

The use of coal first became widespread in Britain during the Roman period, and has been reported from excavations at over 200 Roman sites, in association with, for example, metal-working activities, hypocausts and a cremation pyre. In order to establish provenance, samples from 70 localities have been analysed by Smith, using chemical and/or microscopical methods. Within the study area, there are coalfields in North and South Wales, Shropshire and Worcestershire, the Forest of Dean, the Coalpit Heath Basin in South Gloucestershire and Bristol, and at the Radstock Basin in Somerset.

The site finds of coal are heavily concentrated around the Severn Estuary, with only outliers at Heron Bridge (a *canaba* satellite of Chester) and the baths at Wroxeter providing evidence of use. Examples of military use come from Caerwent, Caerleon, and Usk; from villa sites at Llantwit Major, Great Witcombe, Chedworth, Chew Valley, Star, Gatcombe and Marshfield. Coal from the nearest coalfield could have been transported to many sites using the known Roman road system, but some coal samples from Caerleon and Llantwit Major, have been provenanced to the Forest of Dean, clearly indicating the use of water transport (Smith 1996, 373-89; 1997, 297-324). Water transport of small quantities of coal across the Bristol Channel is illustrated by the use of the Watchet "flatner", a 5.5 metre flat-bottomed boat in common use on the North Somerset coast (Banks 1999). Within living memory, this craft was used to "pop across to Barry (on the South Wales coast) for a free load of coal" (John Nash 2002 *pers.com.*), showing not only the sea-going capability of this small craft, but also the effective cross-Channel use of local water transport.

<u>Pottery</u>

Severn Valley Ware occurs as a range of forms including jars, tankards and bowls, and is one of the most widespread classes of Roman coarse pottery found on sites in the West of England. As yet, only a few kilns producing this type have been identified, these are not confined to the immediate area of the Severn, with possible sites being identified at Perry Barr, Shepton Mallet and Wroxeter, in addition to Gloucester itself. No major production site has, as yet, been identified and the industry would seem to be one of small-scale production of similar forms, in a similar fabric, but from a variety of centres. The main distribution area is concentrated in the catchment area of the river Severn, its estuary and main tributaries and the presence of Severn Valley Ware as far up-river as Caersws indicates that the river was used for transport. An exception is the supply, mainly of tankards, to the western sector of Hadrian's Wall during the 2nd century, and it is probable that shipment from Gloucester to the northern garrisons took place via the Western Seaways (Webster 1976, 18-46). Significant quantities of other types, in particular South East Dorset Black Burnished Ware, were used within, or were in transit through, the study area (Allen & Fulford 1996, 223-81).

Fulford argues that the importation of pottery was only a minor trade, "tacked on" to bulkier cargoes of perishables (1984, 129-42). For example, decorated hemispherical cups, and ovoid beakers in colour-coated fabrics, were manufactured in the province of Baetica in southern Spain, during the 1st century AD, probably in the valley of the Guadalquivir (Greene 1979, 67-73). This ware has been found in France, Britain and Germany, and in large quantities around the coast of the Mediterranean. The Port Vendres II shipwreck yielded a quantity of this type of pottery, shipped together with several varieties of Baetican amphoras. The valley of the Guadalquivir was a major source for the export of olive oil, often shipped in Dressel 20 amphoras. It seems clear that a few cases of fine ware were included with the major cargo, thus incurring no transport costs and permitting distribution in an area that would normally have been serviced from the major kilns at Lyon. It seems probable that the finds in Britain may have been the result of a similar type of "piggy-back" cargo loading.

Ship cargo-carrying capacities

The Roman merchant fleet of the Mediterranean included both shallow-draught vessels capable of carrying heavy loads, and efficient seagoing sailing ships capable of loading large cargoes; the average cargo capacity of Roman ships was not exceeded until the 15th century, and that of the largest ships, not until the 19th century (Greene 1986, 25). Parker (1992, 26) suggests that the most common type of vessel, found in all periods, carried under 75 tons of cargo or, for example, approximately 1500 amphoras. From the 1st century BC to the 3rd century AD vessels of 75-200 tons, capable of carrying 2000 to 3,000 amphoras became common in the Mediterranean. Parker (1990, 335-46) has shown that there is a general tendency towards smaller ships in the later Roman period and also that, by the 4th century, ships were being built with a greater reliance on iron-bolt and nail-fastenings, rather than the traditional mortice-and-tenon jointing. He sees this trend towards smaller and less expensive vessels as the result of a decline in volume, and therefore profitability of trade, although accepts it may alternatively indicate changes in the organisation of trade, to conduct more and shorter journeys.

Evidence from British waters

In Britain, two wrecks of two sea-going ships of the period have been excavated; from London the Blackfriars 1 ship (Marsden 1994), and from Guernsey the St Peter Port ship (Rule & Monaghan 1993). The smaller (c. 4 ton) Barland's Farm Boat (Nayling, Maynard & McGrail 1994), is best described as a coastal and estuary vessel, and the remains were found some 3 km from the present foreshore of the Severn Estuary. The wrecks of the County Hall ship and the New Guy's House boat (both limited to operating in rivers and estuaries) were found in London (Marsden 1994).

These vessels have been described and illustrated in Chapter 3, but in this section, the cargo carrying capacity will be the main concern, in order that, in the following chapter, the data may be used as a basis for estimating the volume of shipping during the period. The vessels themselves are first discussed, with relevant comments on their cargo carrying capacity, and these are followed by comments on the relationship between cargo stowage and ship stability.

Blackfriars 1 ship

The Blackfriars 1 ship, of the 2nd century AD, was probably 18.5 m in length, with a beam of 6.1 m and a gunwale height amidships of about 2.8 m. The ship was fully decked with a main hold, and possibly a cabin on the after deck. Marsden has pointed out that different types of cargo take up varying volumes, and has calculated that possible cargoes for the Blackfriars 1 ship could have been; 28 cubic metres of ragstone weighing 36.4 tonnes, 12 large barrels of wine, each weighing 1.278 tonnes (15.336 tonnes), or 18.36 tonnes of grain. Compared to the ragstone cargo, the lesser weight of cargo for wine is explicable by the voids surrounding the barrels, and that of wheat (whether loose or bagged) by the low density, and high bulk of the product (Marsden 1994, 89). If used in a military role [a modern analogy would be the ships of the "Royal Fleet Auxiliary" (Chapter 5)], a vessel similar in size and hold capacity, might carry 70 infantry or 15 cavalrymen and their horses (Grainge 2002, 45-51).

St Peter Port ship

The late 3rd century AD St Peter Port ship was decked, with main and aft holds, was 25 m in length, with a maximum beam of 6 m, and a height to the gunwale of at least 3 m and, although the bow structure had disintegrated, the excavators suggest that the ship was double-ended (Rule & Monaghan 1993, 13-70). The vessel's final cargo was a large quantity of pitch blocks, stored in the main hold of the ship, the most likely provenance for the pitch is from the pine-forests of Western France. The after hold contained fragmentary remains of oak barrels or casks, all of which were charred to a greater or lesser extent. If these contained wine, a northern European origin is indicated, as products of the Mediterranean provinces were transported in amphoras. Two Dressel 30 amphoras, thought to originate in Algeria in the 3rd/early 4th century, probably carried olive oil, although it is possible that they were being re-used for general liquid supplies, such as fresh water. The excavators speculate that it operated primarily in the Channel, with perhaps occasional voyages as far south as Atlantic Spain or as far east as the North Sea, operating as a coastal trader moving cargoes of opportunity from point to point (*ibid.* 130). In the body of the report, no reference is made to the cargo-carrying capacity of the ship, but similarity to the 25 m x 6.5 m x 2.5 m dimensions of the Dublin "keel" (McGrail 1993); suggest a cargo capacity of some 60 tonnes.

In Appendix III (1993, 135), an estimated capacity of the main hold is given as 130 cubic metres, and an additional capacity of the stern and bow holds as 30 cubic metres. Unfortunately, no reconstruction drawings of the hull are provided, nor any indication of the method of arriving at these capacities, and so it is difficult to determine the accuracy of these figures. However, the beam of St Peter Port ship (6 m) and Blackfriars 1 (6.1 m) are almost identical, and the height of deck above keel are again very similar at 2+ m and 2.15 m respectively. The St Peter Port ship length of 25 m represents an increase of 35% over the 18.5 m length of Blackfriars 1, and as both beam profiles are similar (above) a proportionate increase above the 28 cubic metres main hold capacity of Blackfriars (Marsden 1994, 195) to c. 37.8 cubic metres might be expected. Rule and Monaghan's estimate of 130 cubic metres seems therefore significantly overstated.

Barland's Farm boat

The sea-keeping capabilities of the un-decked Barland's Farm boat (11.4 m length x 3.2 beam x 0.9 gunwale height) would have enabled it to make passages throughout the length and breadth of the Bristol Channel. With her shallow draft, the vessel could also have operated in the local rivers, certainly within the tidal reaches, and in many cases of progressing well inland, transporting cargoes to and from many of the Roman forts and settlements in the study area. The excavators suggest that, lightly loaded, the boat could have carried 15 medium-sized barrels of wine (actual size is not specified); 90 sacks of grain (again not detailed), or 4.5 tonnes of salt/coal in sacks; or the same weight of iron, slate or stone laid on dunnage in the bottom of the boat. Livestock could have been carried, provided they were temporarily penned by hurdles or with their legs trussed, and possible loads could be up to 50 sheep or 8 cattle (Nayling, Maynard & McGrail 1999, 133-46). Only some 3 km from the site of the Barland's Farm boat, an open boat of the type known as a "keel" has been excavated (Nayling 1998). Firmly dated by dendrochronology to AD 1240, the vessel is estimated to have a length of 13.2 m, a beam of 3.7 m and a depth of 1.23 m. The excavators suggest a cargo-carrying capacity of 3.75 tonnes and this ties in well with that of the Barland's Farm boat. Of interest are the comments concerning the dock at Beaumaris Castle on Anglesey, which provided docking for sea-going vessels measuring a maximum of 14.4 m in length (*ibid.* 135), therefore suggesting that vessels of similar size, with a single mast and square sail, to the Barland's Farm boat, were fully capable of open-sea voyages.

County Hall ship

The theoretical reconstruction of the County Hall ship, (built c. AD 300) indicates a length of 19 m, a beam of 5 m and a height to the top of the gunwale of some 2 m. The decline during the 4th century in the importance of *Londinium* as a port, is evidenced by the fact that the 2nd and 3rd century quays found there were decaying, and had been separated from the rest of the city by a riverside defensive wall (Brigham 1990a, 140-1) and that at other locations silted deposits had accumulated at the front of quays. As goods were still being imported into the city, some limited facilities for berthing and lading must have existed, but they have not, as yet, been located. It therefore seems possible that seagoing ships were moored in the river, and unloaded their cargoes into shallow draft barges, Marsden (1994, 108) suggests that the County Hall ship might have been used in this way.

New Guy's House boat

This was probably a broad, barge-like vessel, of the 2nd century AD, but as only one end, and part of one side, was excavated; only a tentative reconstruction of the entire vessel has been possible. However, by analogy with Romano-Celtic barges found on the Rhine, it is probable that both ends were pointed and it has been calculated that the vessel had a total length of at least 16 m, a beam of some 4.25 m and a height amidships of about 1 m. With such limited freeboard, it is clear that the vessel could not have been used in the open sea, and was probably a river barge, with a cargo-carrying capacity of about 6 tonnes, designed for use in the shallows of the Thames and its tributaries (Marsden 1994, 97-104).

The liburnian as a cargo carrier

By using the number of ships (3) and the probable strength (360) of the unit of rebellious Usipians (*Tac.Ag.*28) as a yardstick, Martin (1992, 9-12) has estimated the cargo carrying capability capacity of a *liburnian* (see Chapter 5). Based on a complement made up (say) of 60 oarsman and 60 supernumeraries, in a cargo carrying role, the supernumerary element would be replaced by "a minimum disposable capacity of 5 tons". The theoretically reconstructed *liburnian* shown in Figure 5.6 has a length of 18 m, a beam of 3 m and a height amidships of 1.75 m, this is similar to the dimensions of the New Guy's House boat. Whilst taking into account the respective roles of sea-going naval vessel and cargo-carrying river craft (6 tonnes), there is still sufficient correspondence to suggest that Martin's estimate is soundly based. It is, however, suggested that by removing the lower bank of oars (the *liburnian* was a *bireme* – see Figure 5.5), a significant increase in capacity might be achieved. In a cargo carrying role, the loss of maximum speed under oars, would not be of great importance, the vessel whenever possible being sailed, but the assets of manoeuverability and ability to progress in light airs would be retained. Using Martin's figures as a basis, the reduction in the number of oarsmen might result in an additional cargo-carrying capacity of at least 2 tonnes.

Cargo stowage and ship stability

A vessel's cargo has to be stowed and distributed so that it has a safe freeboard and adequate stability. Freeboard is the vertical distance between the highest watertight deck (or top of sides in an open boat) and the waterline. As cargo is loaded, draft is increased, and freeboard is lowered, if loaded to where the freeboard is below a safe minimum, a vessel may ship water and founder. On the other hand, if too lightly loaded, and therefore with excessive freeboard, ship-handling and steering capabilities are lessened, and the power to carry sail may be reduced. When a ship is transversely displaced from the upright ("heels"), it is essential that there is sufficient righting moment for the vessel to return to the upright. A balance needs to be struck between a "stiff" condition where the ship returns upright too rapidly, and a "tender" condition where the vessel will only slowly return upright. "Stiffness" leads to violent motion and the vessel becomes less sea-kindly; in cases of excessive "tenderness", the vessel may roll to a point from which it is unstable and cannot recover to the vertical (McGrail 1989, 353-8).

It is therefore necessary that a vessel be loaded so that neither freeboard nor stability are compromised, and the two main factors to be considered are the total weight of cargo (affecting the freeboard), and its distribution within the hold affecting the stability. In the case of a single commodity cargo, e.g. amphoras or grain, the total weight of cargo is the significant factor, but with a mixed cargo (say the addition of a consignment of lead to either of these cargoes), the problem of effective distribution is added. At its simplest, the master would load the lead on the bottom of the hold, with the less dense grain or amphoras above. In the case of a single destination cargo this is relatively simple, but in the case of coastal trading (multiple consignments, to and from several destinations), the role suggested for the St Peter Port ship (Rule & Monaghan 1993, 130), the problem is more complex. It is probable that, in particular, military cargoes comprised major cargoes of either grain, olive oil or wine, (stone or timber being confined to periods of construction and refurbishment), but is equally probable that items of equipment and pottery were "piggy-backed". Therefore, if several forts were to be supplied during the course of one voyage, the sequence of loading needed to reflect the most effective sequence of unloading, and therefore became similar to the problems of cabotage. In the case of merchant shipping, it was the aim to pick up new cargoes whenever possible, but as these would not usually be forthcoming at a military establishment (minerals under Imperial control, as at Caernarfon are a possible exception), return "in ballast" was more usual. In this case, high density disposable commodities such as rubble, gravel, shingle or sand were loaded in the bottom of the hold to maintain stability, and this is the probable reason for the quantities of Pressili slate found near the quay at Caerleon.

Vessel tonnage

An old American customhouse formula, (length of keel × beam × depth of hold) ÷ 94, with all dimensions represented in feet, was used to calculate the tonnage (Steffy 1982, 85) of the Yassı Ada ship (see below). Applying this to Blackfriars 1 gives a tonnage of 55, compared to Marsden's (1994, 89) estimate of 50, and to the St Peter Port ship gives a tonnage of 69 (Rule & Monaghan do not give an estimate of tonnage). When the formula used for Blackfriars 1 and St Peter Port is applied to the Yassı Ada ship, [(keel 40 × beam 17 × depth of hold 10) ÷ 94], a 50 ton volume is indicated. From 1773, the tonnage of British merchant ships was calculated by a statutory formula of [(length overall × 60% beam) × 50% beam] ÷ 94 giving 51 tonnes for Blackfriars 1, 72 for St Peter Port and 58 for Yassı Ada. These differences illustrate the problems of applying varying formulae, but show sufficient similarity to suggest a general indication of comparative tonnages.

Stowage factors

The quantity of cargo that may be loaded to fill a hold of known capacity is calculated by the use of "stowage factors" (Appendix 10), and were used in Marsden's above calculations of the cargo-carrying capacity of Blackfriars 1 (1994, 195-6). These factors take into account the volume and weight of cargo, as well as the interstices between items, space lost to containers and dunnage. Expressed in cubic metres per tonne, the factors range from tin ingots at 0.28, through iron scrap at 0.98 and earthenware in crates at 2.13, to bales of wool at 6.00. In the Roman period, a ship's master would have made analogous estimates, based on experience and inherited rule of thumb (McGrail 1989, 356).

Examples of the calculations for Blackfriars 1 are;

A cargo of 12 barrels of wine for Blackfriars 1, based on a known barrel weight, when full, of 1.278 tonnes, a stowage factor of 1.78 and a hold volume of 28 cubic metres is

$1.278 \times 1.78 = 2.27$ cubic metres = volume occupied by one barrel

$28 \div 2.27 = 12.33$ = barrel capacity of hold

A similar calculation for large sacks of grain (weight 0.68 tonnes; stowage factor 1.5) is

$0.68 \times 1.5 = 1.02$ cubic metres = volume occupied by one sack

$28 \div 1.02 = 27.45$ = sack capacity of hold

and for the ragstone cargo

$28 \div 1.3$ (weight of 1 cubic metre of ragstone) = 21 = tonnage of ragstone.

Amphoras

Stowage factors were calculated for modern ships and, not surprisingly, amphoras are missing from the list, so it will be necessary (and arguably beneficial as archaeological evidence is used), to turn to other sources of information. As there are no significant remains of amphoras in wrecks from British waters, data from the well-excavated and well-published wreck of the

Byzantine ship, wrecked at Yassı Ada, off the coast of Turkey, whilst carrying a cargo of c. 900 amphoras, will be used (Bass & van Doorninck 1982). Using a detailed 1:10 scale reconstruction of the vessel, Steffy (1982, 86) considered that a further 300 amphoras could have been stowed below decks, giving a total tonnage of slightly over 60 tonnes, and therefore in the same range as the Blackfriars 1 and St Peter Port ships. It would, however, be unwise to transfer the maximum amphora loading of the Yassı Ada ship to a northern European context. Firstly, Steffy himself considers the number would have "loaded her a bit tightly" and, secondly, he suggests that the Byzantines "were probably fair weather sailors, keeping their ships in port when the strong winds blew from the north" (*ibid.*).

Detailed analysis of the Yassı Ada amphoras has been conducted (Bass 1982, 155-65), revealing two distinct types, defined by shape, weight and capacity. Amphoras of Type 1 have nearly cylindrical bodies, tapering slightly to plain round bases, and are usually pinched at the waist to give an "hour-glass" shape. With an average capacity of 8.2 litres, the weight, when full with wine, is calculated as c. 12.5 kg. Type 2 amphoras are nearly globular with the maximum diameter at the shoulder, again with a plain and rounded bottom, but because a differences in size, have been divided into "Small" and "Large" categories. Large Type 2 amphoras have an average capacity of 36.2 litres and a full weight of c. 46.6 kg. Small Type 2 amphoras have an average capacity of 15.3 litres and a full weight of 20 kg. The estimated number of amphoras of each type was 113 of Type 1 (weight 1,413 kg), 702 of Type 2 large (32,713 kg) and 85 of Type 2 small (1,701 kg), a total of 35,827 kg (van Doorninck 1982, 161-3).

Taking Steffy's maximum 50 tonne loading, and proportionately increasing the quantity of Type 2 large to fill the hold (32,714 kg = c. 66% of 50,000kg), a full hold would accommodate c.1050 amphoras (702 + 50%), i.e. 21 amphoras per ton of cargo carrying capacity. The large type 2 amphoras, containing 36 litres of wine, are sufficiently similar in shape, size and capacity to invite comparison with the Gauloise 4 wine amphoras, present in Britain from the late 1st to the early 3rd century AD (Tyers 1996, 95). A Dressel 20 oil amphora containing 62 litres of olive oil weighs c. 84 kg (Peacock & Williams 1986, 52) and by comparison would lead to a cargo-carrying capacity of 595 amphoras, i.e. 12 amphoras per ton of cargo.

Level of loading

The seabed remains of cargoes of Mediterranean wrecks have usually been found to be less in weight than the hold capacity of theoretical reconstructions, and whilst this may be the result of non-recovery of the total amount carried, it is possible that loading to the maximum level was not normal practice (Parker 2004. *pers.com*). Whilst the maximum amount of cargo delivered produces the greatest return on investment, the sea-keeping capability of a vessel is of paramount importance. It has been stated above that a major factor in safety is freeboard, and that this represents the safety margin, indicating to what depths a vessel may be loaded, dependant on the type of cargo, waters to be navigated, and the season of the year. Prudent masters and skippers could have followed this practice. For example, Marsden has calculated that the Blackfriars 1 ship could have carried a cargo of about 50 tonnes, that the estimated 26 tonnes of ragstone found in the ship would have only partly filled the hold, and that there was capacity for a further 24 tonnes of cargo (1994, 81, 89). However, it was not until the Merchant Shipping Act of 1875, instigated by Samuel Plimsoll, that a safe freeboard became a legal requirement.

An average sea-going merchant ship?

Based on the St Peter Port and Blackfriars ships, an average merchant ship of the period may have had a cargo-carrying capacity of some 60 tons and a hold capacity of c. 33 cubic metres. Whilst accepting that the sample is small, and may need to be amended in the light of future discoveries, this will be used as the basis for the calculation of volumes of traffic for sea-going ships. From shipwreck evidence, the commonest type of merchant vessel found in the Mediterranean carried less than 75 tons of cargo, some 1500 amphoras (Parker 1992, 89) and this gives some support to the suggested size of vessel. Using a ship of 60 tons results in estimated single commodity cargoes of 32 tonnes of grain in sacks, 25,000 litres of olive oil in Dressel 20 amphoras or a similar quantity of wine in Gauloise 4 amphoras.

Conclusion

It is accepted that much of the foregoing is based on limited archaeological evidence, on even less written data (the Vindolanda Tablets being a notable exception), and that a number of assumptions have been made. For example, the suggested shiploads to supply a fort, are approximations, and would be subject to changes in ration strengths and composition. Grain from the surrounding countryside might be available, locally brewed beer might replace wine, or animal fats be substituted for olive oil, and the figures are therefore intended only as an order of guidance.

In addition to the vessels discussed above, several types of wooden craft, similar to the new County Hall ship, the Hasholme logboat, the Brigg raft, and hide covered curragh type boats and coracles operated on the estuaries and far inland on the rivers of Britain. For instance, the revetment of a riverbank at the fort at Pumpsaint, suggests that local water transport was in use well inland, at a height of 130m in the Welsh hills. Descriptions and illustrations of these types of local craft are given in Chapter 3, and from these an average length of 15 metres, and a cargo-carrying capacity of 5 tonnes are probable.

Based on the commodity and tonnage estimates (and they can only be regarded as such) arrived at in this chapter, these figures will be used to assess the volume of shipping during the Romano-British period.

Chapter 9. Waterways and roads

Introduction

Hopkins considered that "Above all we need to know the volume and value of trade in the classical world. We need to know what was traded, and the routes along which food, goods and metals flowed. How much did the volume, value, contents and direction of trade change over time and between regions during classical antiquity?" (1983. xxi). This chapter will address transport routes by sea and river and, in order to present a balanced view, Roman roads and road transport will also be examined. "What was traded" has been discussed in Chapter 8, the ships and boats of the period were examined in Chapter 3. The economy of Roman Britain has been subject to much discussion (for example, Fulford 1989, 175-202; Millett 1990, 157-180), and this is not the place to do other than draw attention to certain aspects that have particular relevance to the main thrust of the thesis. However, it has become obvious that the absence of documentary evidence seriously hampers any assessment of the Romano-British economy, and a plethora of modern distribution maps is no substitute for the Roman equivalent of invoices or bills of lading. The Atlantic route will be examined in some detail, and it will be suggested that a pre-occupation with "The cross-Channel trade" is not relevant to the west coasts of Britain. Throughout this thesis, it has often been necessary to refer to later periods, and this chapter will be no exception.

The early Western Seaways

Sailing from *Massalia* (Marseilles), the navigator Pytheas evaded the Carthaginian blockade, passed through the Straits of Gibraltar and headed north, perhaps in search of the source of tin obtained by the Carthagians from an island in North Western Europe. He wrote of the islands of "Albion" and "Ierne" and commented on several geographical peculiarities, notably the tides. After circumnavigating Ireland he sailed north for six days and reached an island which he called "Thule" (probably Iceland). Cunliffe (2001, 91/2) suggests that, rather than passing through the Straits of Gibraltar in a Mediterranean type vessel, Pytheas avoided the Carthaginian blockade by travelling over-land from Marseilles to the Gironde, joining a local ship, and then changed vessels as the voyage progressed.

Extracts from the "*Massaliote periplus*", an early 6th century BC guide to coastal pilotage were preserved by Avienus in his AD 4th century poem "*Ora Maritima*" (Hawkes 1977, 19). McGrail (1990, 36) has extracted the following from Murphy's translation (1977, lines 94-16);

"The hardy and industrious peoples of the islands and coasts are of the lands around Ushant or Ouessant were heavily involved in maritime trade, much of it in tin and lead. They used hide boats on these oceanic voyages. From Ushant/Ouessant it is two-days' sail to Ireland and Albion is sighted on this voyage. Merchants from Tartessus, from Carthage, and from the vicinity of the Pillars of Hercules sailed to the Ushant/Ouessant region to trade".

Writing at the end of the 1st century BC, Strabo described four sailing routes between Gaul and Britain, "namely from the mouths of the rivers Rhine, Seine, and Loire and Garronne. Those who put to sea from the region around the Rhine do not, however, sail from the river estuary itself, but from the Moroni, who are the neighbours of the Menapi and in whose territory lies Itium, used by the deified Caesar as a harbour when he crossed to the island" (N.H.. 4.5, 2). He stated the distance of the crossing to Britain from the rivers of Gaul as 320 stades (57 kilometres), that from the mouth of the Seine "it is less than a day's run to Britain" (*ibid.*1, 14) and that "People setting out, sail on an ebb tide in the evening, land about the eighth hour of the following day" (*ibid.*3, 4). Ammianus Marcellinus comments that Boulogne "is separated from the tract of land opposite by the narrows of the tidal sea, wont as it is still to rise in astonishing surges and then, without any harm to those plying it, to subside until it has all the appearance of a plain" (XXVII, 8).

Pre-conquest cross-channel trade

Before the Caesarean conquest significant quantities of northem Italian wine were transported to Bordeaux, along the Aude and Garonne rivers, for onward shipment to Britain. Caesar commented that "Of the whole seaboard in that region the Veneti exercise the most extensive sway, because they have very many vessels and in these they are accustomed to sail to Britain" (*BGall.* 2, 4). Despite Caesar's emphasis on the dominance of the Veneti their presence in Britain is not well documented in the archaeological record, but Cunliffe (1982, 43-5) has pointed out that the Coriosolites from Britanny are, both in coins and pottery, more widely represented. McGrail therefore concluded that the Veneti specialised in trading voyages along the Atlantic coast from the Loire to Ushant, across the western Channel route to Britain, and possibly to Ireland, and that the Coriosolites used a mid-Channel route from Alet and the Cotentin peninsula (1990, 41). Significant quantities of sherds of Dressel lA amphoras, together with distinctive Armorican pottery, have been found at Hengistbury Head on the Dorset coast. The headland protected a sheltered harbour and the rivers Stour and Avon provided access to the prosperous areas of Wessex chalkland. In addition to surpluses of corn and wool from the Wessex area, the hinterland produced iron, salt and Kimmeridge shale. Evidence of lead, copper, silver and tin ore from southwest Britain has been found and it is clear that Hengistbury functioned at this time as a port-of-trade with cross-channel imports of wine, pottery, glass and tableware together with exotic fruit such as figs (Cunliffe 1978). The existence of Hengistbury as a major port of trade was comparatively short-lived, as Caesar's conquest of Gaul led to a decline in volume of trade, as the economic and political centre of Britain shifted to the east, where the Thames provided a convenient access to the established transport systems of the rivers of Northen Gaul. By the early Roman period Hengistbury Head had lost its economic importance and was, to all intents and purposes, abandoned as a port-of-trade.

Pre-Conquest trade in the Irish Sea Province

Maritime archaeology has revealed evidence of pre-Conquest Roman shipping in the west of Britain. Near the Porcupine Bank, 150 miles off the West Coast of Ireland, a jar (*olla*) of 1st century BC grey-ware, was dredged up in 150 fathoms of water by a trawler (Nash-Williams, Journal of Roman Studies xxiv. 1934.). An anchor-stock found in 1976, off Porth Felen, a rocky cove on the tip of the Lleyn Peninsula of North Wales is of a Mediterranean pattern, obsolete by the time of the Roman conquest of Wales, from its decoration it may be assigned to the late 2nd/early 1st century BC (Boon 1977, 10-30). An Arretine sherd of the Augustan period (c. 20 BC-AD 10) was recovered from the island of Steep Holm in the Bristol Channel (*ibid.*1987 b, 375-6).

Cunliffe's model for Iron Age trade between Britain and Gaul envisages a system of redistribution through large maritime trading centres (*emporia*), in particular, Alet in Britanny (Cunliffe 1997), Hengistbury Head in Christchurch Harbour (Cunliffe 1978) and Mount Batten in Plymouth Sound (Cunliffe 1988). He has identified two major axes of trade, and has termed the first the Seine-Solent access and the second the Atlantic route, running up the western seaboard of Gaul, via the Channel Islands, to the southwest of Britain (Cunliffe 1984, 4). Matthews (1996, 16) suggests that Cunliffe "had not adequately considered the Irish Sea evidence", and points to further intermediate trading posts along the western coast of Britain: the Rumps on the north coast of Cornwall, one day's sail from Mount Batten, St David's Head a further days sail across the Bristol Channel, a possible site on Anglesey, with Meols, on the Wirral, a similar distance to the east. His estimates of the time taken to make each passage are, perhaps, somewhat optimistic, particularly the passage from Mount Batten to the Rumps which, in the writer's experience, is unlikely to be made in much less than two days. However, alternative passage plans, taking account of wind and tide, and allowing for temporary anchorage at suitable sheltered havens, would undoubtedly result in a viable route through the Irish Sea.

The maritime trading site at Meols, on the northern tip of the Wirrall peninsula, is situated on the northern coast of the Dee estuary, some 50 km from the Roman port at Chester. Discovered in the early 19th-century, the site has now been washed away by the sea, but sufficient Iron Age material was recovered to indicate clear evidence of long distance trade prior to the Roman occupation of Wales (Hume 1863, 290-2), together with artefacts of the Romano-British period. Two silver coins of the Coriosolites, a tribe of northern Britanny, three Carthaginian drachmas, and one early Celtic gold coin of uncertain origin have been recovered. The coins of the Coriosolites date from the early 1st century BC, prior to any direct Roman interest in Britain or Gaul; the Carthaginians coins are similar to a type known to have been minted in the 2nd/3rd centuries BC and, despite difficulties in identification, the gold coin probably dated to the last half of the 1st century BC. Carthaginian coins are not a rarity in Britain, and coins of the Coriosolites have been found as far north as Hexham in Northumberland and Lesmahago in Lanarkshire (Allen 1961, 273). Matthews argues that the absence from Meols of traded goods, such as pottery or metalwork, does not negate the concept of an *emporium*, as it is suggested that the local population did not produce such goods, nor was their acquisition and display of social or economic value (*ibid.* 20-21).

Trade via the Continental river systems

The Roman conquest of Gaul led to a significant change in trade across the Channel with a permanent shift in the direction of trade; the "longer and more dangerous west coast routes" appear to have declined, as "internal routes and markets within Gaul became secure" (Fulford 1991, 35-6). It has been suggested that contributory factors were the dangers of an exposed Atlantic coastline, delays caused by trying to round headlands with unsuitable winds and the limited trading market on the Atlantic coast compared with that on the inland rivers (Marsden 1994, 157). In the 1st century BC/1st century AD, the majority of trade between the Mediterranean and the Northern Provinces was via the Rhone and Aude, and then to the Garonne, Loire, Seine or Rhine and, after loading on to local ships, then cross-channel to Britain (Peacock 1978, 49-51; Parker 1980, 56; Cunliffe 1984, 3-23). Shipment on the major continental river routes, during the Roman period, involved a long chain of transhipment centres, where "cargoes would be laboriously transferred from cart to river barge, or from river barge to seagoing ship, the process involving much double or treble handling of loads" (Milne 1990, 82). However, Greene suggests that the number of trading points along a particular route will have been an important cost consideration. Although the longest route via Gibraltar is the cheapest, that via the Mosel and Rhine would have made contact with the greatest number of major cities and fortresses, and might have proved to be the most profitable (Greene 1986, 40-1).

Richborough, protected by the Isle of Thanet, appears to have been the major transhipment centre for goods arriving via the River Rhine in the 1st century, with Dover and London developing in the late 1st and early 2nd (Philp 1981; Milne 1985; 1995). By the late 3rd century the London harbour was not being maintained and traffic along the Rhine axis seems to have diminished in the late 3rd and 4th centuries, with a shift westwards along the Channel to reflect the River Seine route (Milne 1993, 11-15).

Greene's map of routes from the Mediterranean to Britain (*Figure* 9.1) is accompanied by a graph (*Figure* 9.2) demonstrating that the Atlantic route incurs a transport cost index of less than 80% of the Garonne/Atlantic route, and only 37% of the most expensive Rhone/Mosel/Rhine route. The graph illustrates the effects of the different routes and the means of transport costs, using the ratios established by Duncan-Jones (1974, 366-9).

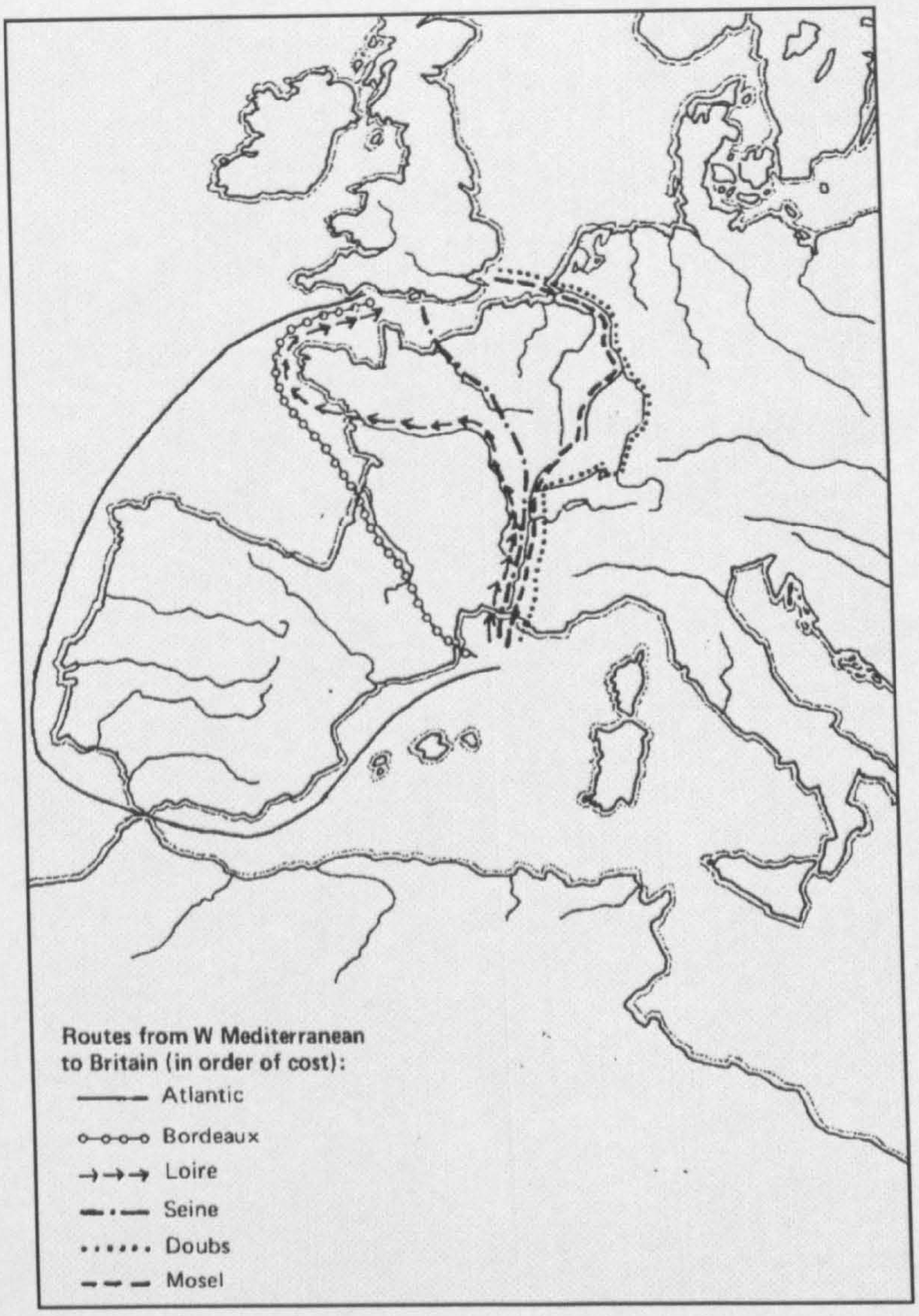


Figure 9.1. Possible routes by which cargoes could have been conveyed from the west Mediterranean to Britain. (after Peacock)

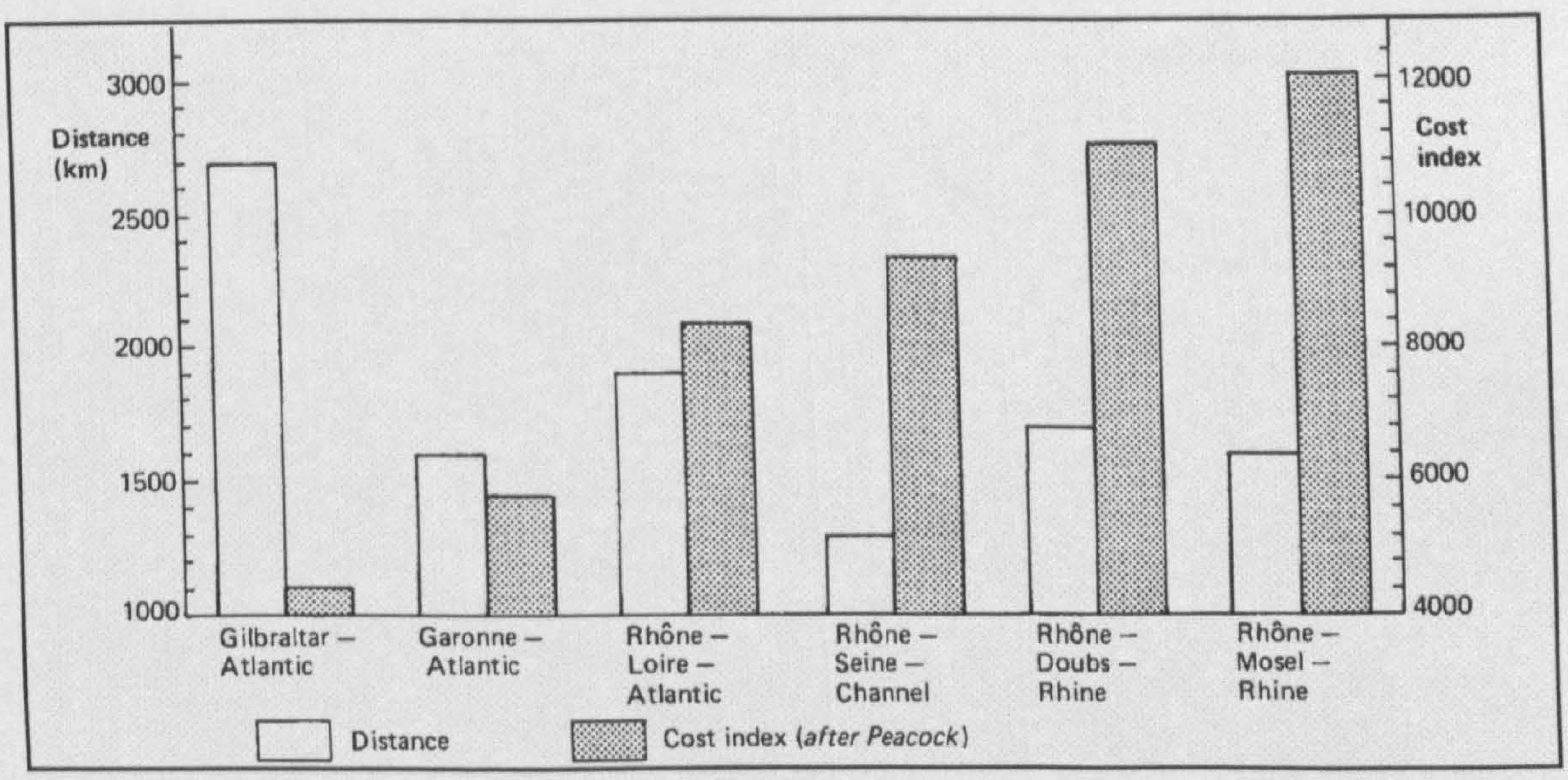


Figure 9.2. Graph illustrating the effects of different routes, and means of transport, on cost of routes to Britain. (Millett after Peacock)

Spanish olive oil and the Atlantic route

Though the continental river routes may have been cost-effective for the transport of Mediterranean products, it is arguable this was not the case for Spanish olive oil from Baetica (see Chapter 8) as, if the Continental river routes were employed, at least five transhipments would be required and the source to destination distance would also be increased by some 600 km. Funari's (1996) study of Dressel 20 stamps found in Britain lends some support to a suggestion of direct shipment to Britain via the Atlantic route. He structured four chronological divisions, *i.e.* pre-Flavian, Flavian-Hadrianic, Antonine and 3rd century. Over the whole of Britain, amphoras from the pre-Flavian period accounted for 16% of the total, the Flavian-Hadrianic period for 36%, the Antonine period for 29% and the 3rd century period for 19% and the importation of Spanish olive oil had virtually ended by AD 250. Funari also introduced three broad geographical categories covering the South-East (290 amphoras), Wales (51 amphoras) and Hadrian's Wall (90 amphoras) and was able to calculate patterns of consumption by period for each region. Not surprisingly, consumption in the South-East peaked during the Flavian-Hadrianic period, but both Wales and Hadrian's Wall showed the greatest level of consumption during the Antonine period, reflecting the period of the greatest density of military occupation. Dressel 20 amphora potteries were scattered throughout the three *conuentus* of Hispalis, Astigiti and Corduba. An analysis of their geographical share of the British market shows that the products of Corduba are most common in the South-East, being less frequent in the north and very rare in Wales, Hispalis dominates the amphora market in Wales, and Astigi accounts for the majority of the imports to Hadrian's Wall (*ibid.* 76-82). This might suggest some form of governmental control of the olive oil supply to the two military regions, but Funari (*ibid.* 86) suggests that this was not necessarily the case, and that there were probably three different trade routes to these areas. Perhaps a better case may be made for two routes, the major being the products of Corduba and Astigi via the Gaulish canals and across the English Channel to the South-East, where the majority of the amphoras remained, with the supplies for Hadrian's Wall being shipped up the east coast of Britain via the North Sea, probably to the supply depot at South Shields (*Arbeia*). This leads to the suggestion of direct shipment of the Hispalic amphoras from the Guadalquivir to the legionary fortresses at Caerleon and Chester (*Figure* 10.3), from where re-distribution to the forts and settlements of the study area would have taken place. This would have certainly provided a cost-effective alternative, and suggest an argument for greater use of the Atlantic route than is usually considered.

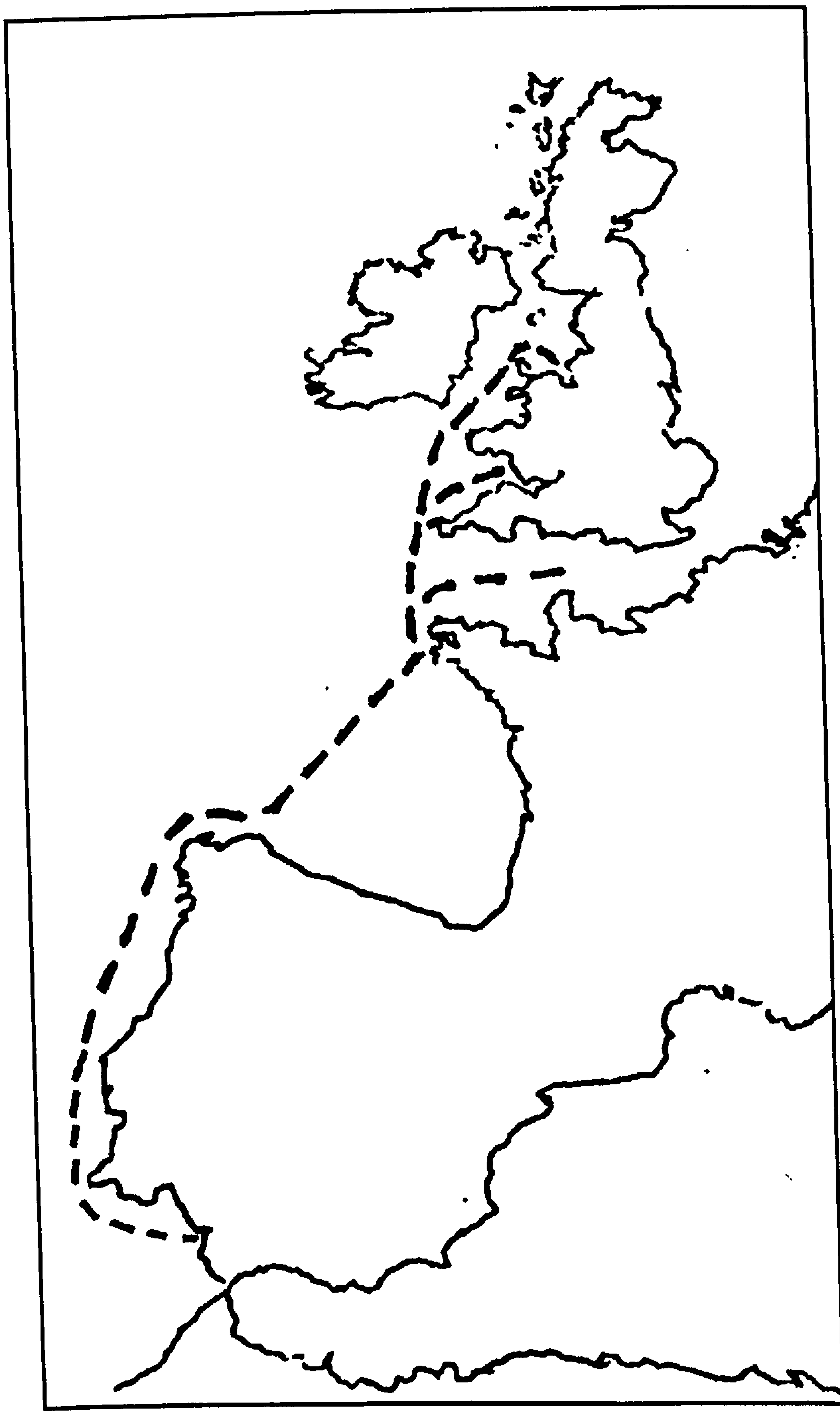


Figure 9.3. A direct route for olive oil from Iberia to the west of Britain, with waypoints at La Coruña, Ushant and Land's End. Compare this with Figure 9.1; note the more direct route and the elimination of trans-shipment points. The implications for more cost-effective shipping are obvious. The map also indicates an option to enter the English Channel.

Why not the Atlantic route?

When considering Roman shipping in the Atlantic, later writers have perhaps been too heavily influenced by Caesar's comments (*BGall.* III. 12) concerning the perils of the "vast and open sea" (*vasto atque aperto mari*). Caesar was familiar with the confined waters of the Mediterranean and, whilst there are undoubtedly areas such as the Aegean that are noted for their strong winds and storms, wind directions are predictable and there are few appreciable tides. This is not to underestimate some of the problems of the western coasts of Britain, where the *Admiralty Pilot* (1974b 16) warns that sea rain can be expected on twenty days per month in winter and fifteen days in summer. The problem is not so much the rain as the restriction of visibility, making reliance on coastal marks unreliable. McGrail agrees (2001, 171-2), but has also emphasised the competence of Celtic seafarers of the Roman period in exploiting the western seaways (*ibid.* 206-7).

The Roman lighthouse, still standing to a height of 33 m, at La Coruña (*Flavium Brigantium*) on the north-western tip of Spain, indicates that navigation in the area was of some significance, and direct passages northwards across the Bay of Biscay from that point to the vicinity of Ushant were certainly possible. Trade with the north of Iberia may be indicated by a Portuguese amphora found at Vindolanda, on Hadrian's Wall (*Britannia* 5, 467). In the sub-Roman period, there is evidence of direct trading-contact between the Eastern Mediterranean and the west of Britain (Campbell 1996, 86), a distance of some 3,000 km from the source. This demonstrates that, in the pursuance of profitable trade, ship owners were prepared to brave the so-called perils of the Atlantic coasts.

The perils of Land's End are also frequently referred to, in this writer's opinion, with little justification. McGrail (1985, 16) considers that "the passage around Lands End, even when the notorious Scilly Isles are left well to the westward, can be difficult and may indeed be impossible for several consecutive days until there is a favourable wind shift". He concludes that an overland portage, from St Michael's Mount to St Ives Bay, "might not only be more reliable but could even be cheaper if the costs of delays due to foul winds are counted". The *Pilots Handbook for the English Channel* (King 1893, 22), is rather more optimistic pointing out that a vessel rounding Land's End after leaving Mount's Bay at half ebb can take advantage of a nine-hour tide up the Bristol Channel [see also *Admiralty Tidal Stream Atlas – Irish Sea and Bristol Channel* (Appendix 11)]. Holbrook is equally concerned with the dangers of "Land's End and the hazardous Atlantic coast of Cornwall" (2001, 152). Peddie dwells at length on the "hazardous weather conditions and dangerous tidal currents around Land's End" and in order to avoid "the dangers and dead haul of supply by ship round Land's End", repeats Mc Grail's case for a trans-peninsula route (1997, 137-45; 155-8).

Evidence from later periods indicates that voyages round Land's End do not appear to have been regarded as being the dangerous undertaking considered by these writers. For example, in 1683, the Port Books of London record 154 shipments from the west, namely 50 voyages from Liverpool, 35 from Bristol, 34 from Chester 15 from Carmarthen, 8 from Blakeney, 4 from Chepstow, 4 from St Ives, 3 from Cardigan and 1 from Padstow (Willan 1938, 206). Present day small boat sailors have a similar attitude, with voyages round Land's End being commonplace by couples in their "seventies" (Craven 2004, *pers. com*).

<u>Coastal Trade</u>

Stray finds of Roman coins on virtually every major beach in Glamorgan and up into the Towy Valley (Murphy 2002, 55-7), demonstrate coastal trading along the Welsh coast and, combined with the evidence of finds from native settlements, indicate trade routes from the forts and towns in the Severn estuary into the Irish Sea. There are many suitable landing places on the west and north coasts of Wales that could have been used by traders, perhaps beaching their vessels. However, excluding military sites, outside the environs of the Severn Estuary and Liverpool Bay, the number of finds of Roman date on the coast is small, and could perhaps be accounted for by occasional visits from a few trading ships. Export from Cornwall of small quantities of stone bowls made from a quartz porphyry (known locally as elvan), show a marked coastal distribution along the south coast, with single examples being found as far distant as Richborough and London. An isolated specimen has been found at Lydney on the Severn Estuary, suggesting trade along the Bristol Channel (Casey & Hoffman 1999, 131, No. 43).

Seasonality of shipping

At sea

Vegetius describes how, in the Mediterranean, sailing "is believed to be safe" from the 27th May until the 24th of September and that from then up to the 11th November "navigation is uncertain". From that time until the 10th of March "the seas are closed" (*Mil.* IV. 39), and the Theodosian Code (XIII.9.3) states that "from the month of November navigation shall be suspended; the month of April, since it is the nearest the summer, shall be used for the acceptance of cargo". Military operations involving the fleet were undertaken outside the normal sailing season, as for example, the crossing from the continent to Britain by the Emperor Constans in the winter of 343 AD, in order to deal with some, as yet, unknown emergency (Salway 1993, 245).

McGrail pointed out that, off the European coasts of the Atlantic, gales of force 7 and above are eight times more frequent during the winter months than in summer, rough seas may be expected one day in four compared with one in twelve in the summer months, and cloud cover is greater in winter and the whole area may be overcast for several successive days. He suggested that the normal sailing season would therefore have been during the months from May to October, with winter coastal voyages being the exception (2001, 171). However, in the 15th century, fleets from British ports bound for Lisbon crossed the Bay of Biscay in the summer, returning in December, bringing with them sweet wine and fruit to be sold at a premium for the Christmas market at home. Hatcher (1993, 476-8) has argued that coastal trading in the North Sea was reduced "to a virtual cessation.....in December and January and a mere trickle in November and February. However, it is probable that the more sheltered waters of the upper Bristol Channel and the Severn Estuary meant that the comparatively short cross-channel passages and estuary voyages could continue, albeit on a reduced scale, during the winter months.

On the rivers

Nevertheless, even on the inland waterways, occasional bad weather led to seasonal stoppages; in January and February 1695, for example, severe frost and intermittent heavy snow impeded trade from clearing Gloucester, and in the winter of 1716-7, ice prevented the movement of Severn trows above Bewdley (Hussey 2002, 47). Pratt commented, “It is certain that in the case of English navigable rivers of any type, magic might require to be done, and spent, in order to keep navigation open. With most of them it was a matter of carrying on an unceasing warfare with elemental conditions" (1912, 158). Flood waters in the River Severn sometimes rendered it impossible for larger vessels to pass under the bridges, so that "a vessel may go up when the water is low, and a freshet may come, and a vessel may not be able to get back again for perhaps many days"(Pratt 1912, 155). By contrast, during the summer months, river levels could fall to a point where navigation was not possible (*Figures* 10.4-6).

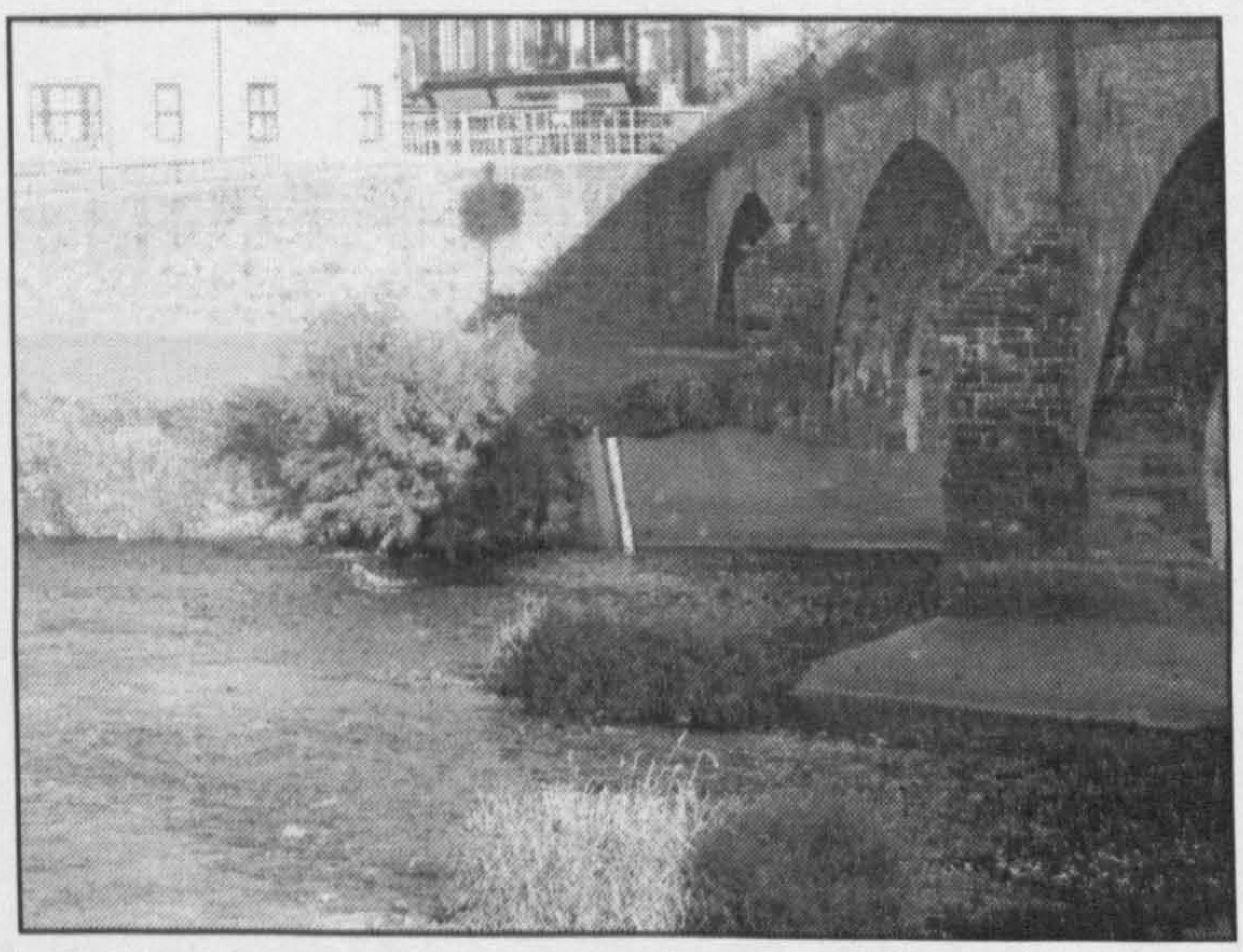


Figure 9.4. Usk Bridge near to the site of the 1st century Roman fortress. Photograph taken on 18 September, after a period of drought. Note level gauge on far river bank.

Figure 9.5. River level on 18 September 2003.

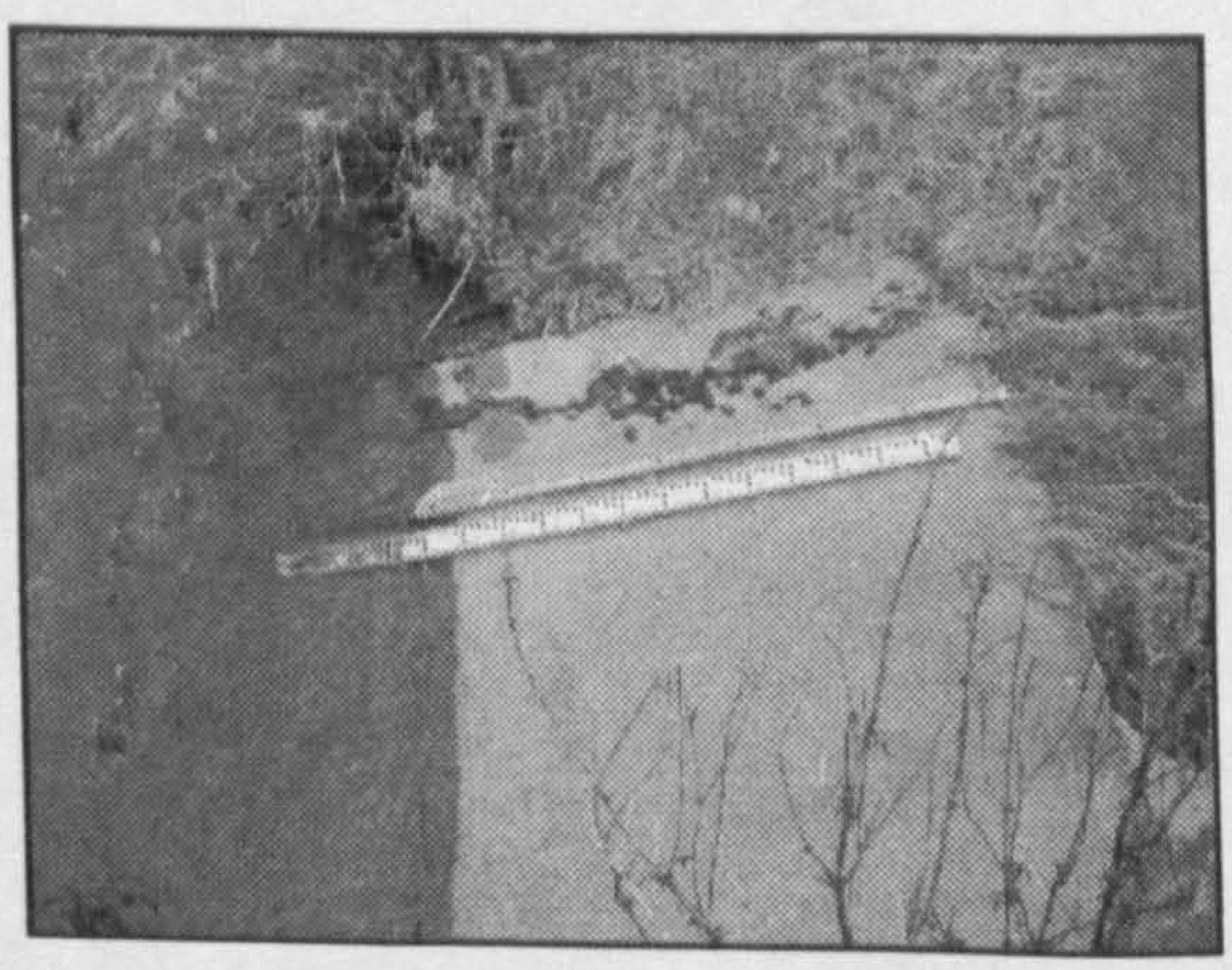


Figure 9.6. River level on 8 March 2004.

The photograph in Figure 9.5 was taken after a period of prolonged draught during the summer; the river would have been un-navigable above the tidal limit at Newbridge. The river had risen by five feet when Figure 9.6 was taken and there was sufficient depth for Usk to be reached by shallow-draught barges.

Waterways of the coasts and rivers

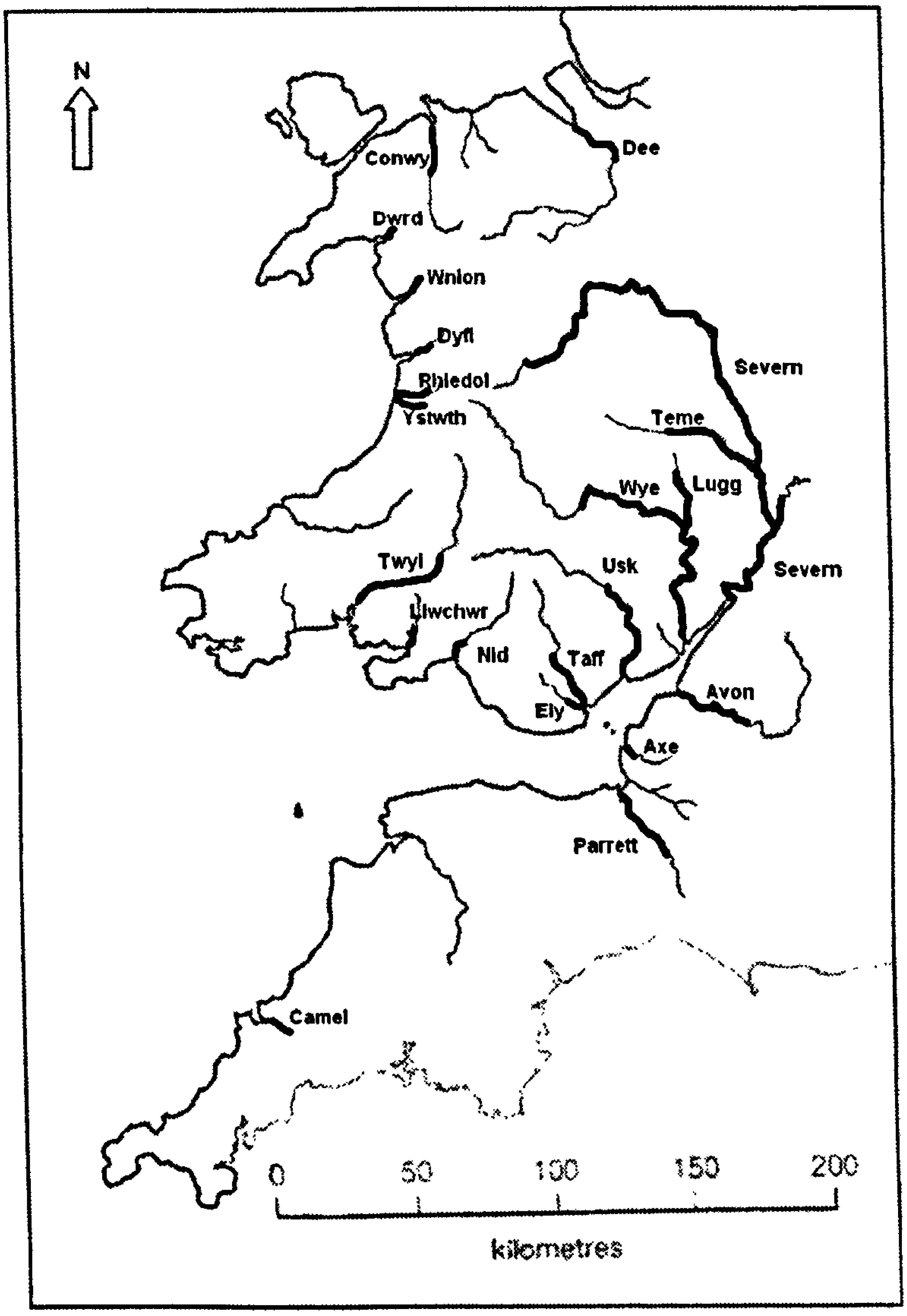


Figure 9.7. Major navigable rivers of the Romano-British period.

The locations on the rivers and coasts that may have been supplied by water transport are shown in Figure 9.8 (below). The data has been extracted from Appendix 1, which contains full details of all sites, including period of occupation, relationship to the road network and Roman name (only infrequently known).

River/coast	Name	Type	Later	Start	End	Latin name
Avon	Charterhouse	Ft	ST	1^{st}.2	2^{nd}.1	*Veb ?*
Avon	Charterhouse	ST		1^{st}.2	4^{th}.2	*Veb ?*
Avon	Sea Mills	Ft	ST	1^{st}.3	1^{st}.3	*Abonae*
Avon	Sea Mills	ST		1^{st}.2	5^{th}.1	*Abonae*
Camel	Nantstallon	Ft		1^{st}.3	1^{st}.3	
Coastal	Caer Gybi	Ft		3^{rd}.4	4^{th}.4	
Coastal	Caernarfon	Ft		1^{st}.4	4^{th}.4	*Segontium*
Coastal	Caerwent	Civ		2^{nd}.1	5^{th}.1	*Venta Silurum*
Coastal	Cardiff 1, 2, 3	Vex		1^{st}.3	2^{nd}.3	
Coastal	Cardiff 4	Ft		3^{rd}.4	4^{th}.4	
Coastal	Erglodd	Ftlt		1^{st}.3	2^{nd}.2	
Coastal	Martinhoe	Ftlt		1^{st}.3	1^{st}.3	
Coastal	Old Barrow	Ftlt		1^{st}.3	1^{st}.3	
Coastal	Steep Holm	Ftlt		1^{st}..2	4^{th}.3	
Coastal	Sudbrook	Ftlt		1^{st}.3	2^{nd}.1	
Conwy	Caerhun	Ft		1^{st}.4	3^{rd}.4	*Canovium*
Dee	Chester	Ftrs		1^{st}.4	3^{rd}.4	*Deva*
Dwrd	Tomen-y-Mur	Ft		1^{st}.4	2^{nd}.2	
Dyfi	Pennal	Ft		1^{st}.4	2^{nd}.2	
Frome	Stretton Grandison	Ft		1^{st}.4	2^{nd}.1	
Llugwy	Bryn-y-Gefeiliau	Ft		1^{st}.4	2^{nd}.2	
Llwchwr	Loughor 1, 2	Ft		1^{st}.3	4^{th}.2	*Leucarum*
Lugg	Blackwardine	ST		1^{st}.4	5^{th}.1	
Nid[F]	Neath 1, 2	Ft		1^{st}.4	4^{th}.1	*Nidum*
Rhiangoll	Pen-y-Gaer	Ft		1^{st}.4	2^{nd}.3	
Rhiedol	Pen Lyn	Ft		1^{st}.4	2^{nd}.1	
Severn	Abertanant	Ft		1^{st}.3	1^{st}.3	
Severn	Caersws 1, 2	Ft		1^{st}.3	4^{th}.1	
Severn	Droitwich	Ft	ST	1^{st}.3	2^{nd}.3	*Salinae*
Severn	Droitwich	ST		1^{st}.3	4^{th}.2	*Salinae*
Severn	Forden Gaer	Ft		1^{st}.4	4^{th}.4	*Lavobrinta*
Severn	Gloucester	Ftrs	Col	1^{st}.3	1^{st}.4	*Glevum*
Severn	Gloucester	Col		1^{st}.4	5^{th}.1	*Glevum*
Severn	Kingsholm	Ftrs		1^{st}.2	1^{st}.3	
Severn	Pentrheyling	Ft		1^{st}.4	4^{th}.2	
Severn	Worcester	ST		1^{st}.3	4^{th}.1	
Severn	Wroxeter	Ftrs	Civ	1^{st}.3	1^{st}.4	*Viroconium*
Severn	Wroxeter	Civ		1^{st}.4	5^{th}.4	*Viroconium*
Taff?	Caerphilly	Ft		1^{st}.3	2^{nd}.3	
Teme	Leintwardine 1, 2	Ft		1^{st}.3	4^{th}.4	*Branogenium*
Teme	Leintwardine	ST		2^{nd}.1	4^{th}.4	*Branogenium*
Thaw	Cowbridge	ST		1^{st}.4	4^{th}.4	*Bovium*
Twyi	Carmarthen	FT	Civ	1^{st}.4	2^{nd}.1	*Moridunum*
Twyi	Carmarthen	Civ		2^{nd}.1	5^{th}.1	*Moridunum*
Tywi	Llandeilo	Ft		1^{st}.4	2^{nd}.1	
Tywi	Llandovery	Ft		1^{st}.3	2^{nd}.3	
Usk	Abergavenny	Ft	ST	1^{st}.3	2^{nd}.2	*Gobannium*
Usk	Abergavenny	ST		1^{st}.3	4^{th}.3	*Gobannium*
Usk	Brecon Gaer	Ft		1^{st}.4	4^{th}.3	*Cicucium*
Usk	Caerleon	Ftrs		1^{st}.4	3^{rd}.4	*Isca*
Usk	Monmouth	ST		1^{st}.4	4^{th}.3	*Blestium*
Usk[F]	Usk	Ftrs	ST	1^{st}.3	1^{st}.4	*Burrium*
Usk	Usk	ST		1^{st}.4	4^{th}.4	*Burrium*
Wnion	Brithdir	Ftlt		1^{st}.4	2^{nd}.2	
Wye	Chepstow	Ft		1^{st}.3	1^{st}.3	
Wye	Clifford	Vex		1^{st}.3	1^{st}.3	
Wye	Clyro	Vex		1^{st}.3	1^{st}.3	
Wye	Kenchester	ST		1^{st}.4	4^{th}.4	
Wye	Monmouth	Ft	ST	1^{st}.3	2^{nd}.1	*Blestium*
Wye	Weston-u-Penyard	Ftlt	ST	1^{st}.3	2^{nd}.3	*Ariconium*
Wye	Weston-u-Penyard	ST		1^{st}.3	4^{th}.3	*Ariconium*
Ystwth	Trawscoed	Ft		1^{st}.4	2^{nd}.2	

Figure 9.8. Table, by name, of locations accessible by water transport

Type: **Col** = *Colonia;* **Civ** = *Civitas;* **Ftrs** = *Fortress;* **Ft** = *Fort;* **Ftlt** = *Fortlet;* **ST** = *Small Town*

Start/End: Shown as century AD by quarter, e.g. 1^{st}*.3 =First century AD, third quarter*

It will be observed that the following rivers (shown on Figure 9.7), could have been navigable during the Romano-British period;

Avon (Bristol)	Axe	Camel
Dee	Dwrd	Dyfi
Llwchwr	Parrett	Conwy
Lugg	Nid	Rhiedol
Severn	Taff	Parrett
Teme	Thaw	Twyi
Usk	Wnion	Wye
Ely	Ystwth	

The degree to which a river was used varied greatly. For example, the River Severn served the fortresses, and then the *colonia* at Gloucester, the fortress, and then the *civitas* capital at Wroxeter, the forts at Caersws, Forden Gaer, Abertanant, Pentreheling, the small industrial towns of Worcester and Droitwich, and numerous villas and small settlements close to its banks. By contrast, the Afon Wnion served only the fortlet at Brithdir.

Compared to the absence today of commercial navigation on any of these rivers, large or small, this level of use may be considered surprising. Of course, the fact that, during the Roman period, a river might have been naturally navigable, or might have been made navigable, does not prove that it was used as a waterway. However, basing their research on the river systems of the Thames, Wash, southern Humber and the Severn, Edwards and Hindle argued that the Medieval rivers of England and Wales were navigable much further upstream than previously believed. They suggested that, since most towns were within reach of navigable waterways, water transport must have been much more significant than had been recognised (1991, 123-34). However, Jones has drawn attention to a decline in the extent of England's navigable inland waterway network during the later Middle Ages. For example, the Foss Dyke was usable by Lincoln ships during the 12th century but by 1335, was "so obstructed that the passage of ships and boats is no longer possible" (Commission of 1335, quoted in Barley 1936, 14). The deterioration of the navigability of the Thames is illustrated by the fact that, at least until the 13th century, vessels laden with grain could pass downriver from Radcot (35 km upriver of Oxford), but by the 15th century the river was not suitable for navigation beyond Reading. He suggests this may be the result of an increase in obstructions to river traffic, such as mill weirs and fish traps. The failure to maintain navigation may also be, in part, associated with a fall in late Medieval urban demand for bulk produce like grain and timber (Jones 2000, 60-82).

Aston has commented that "Roads, tracks, rivers and the small harbours and ports on rivers, estuaries and the coast, were vital for moving goods about in the past" and that "as well as a host of river jetties and trans-shipment points, almost any small cove, beach or inlet around the coast would have been used in earlier times for the loading and unloading of goods" (1985b, 11). The Barland's Farm boat (Figures 3.10, 11 and 12), and the multi-period small port at Magor Pill (Allen 1999, 45-60) confirm that this was the case during the Romano-British period.

Roman roads and road transport

Prior to the arrival of the Romans, there were no engineered roads in Britain - only trackways following natural routes across the landscape. Within a short time of the invasion the army constructed a comprehensive system of roads, with paved or gravel surfaces, and bridges where necessary. This represented a far-reaching modification to the landscape and was a necessary pre-cursor to the development of an integrated economy. However, it must be emphasised that these roads were primarily intended for the movement of military materials, and civilian use was a secondary consideration.

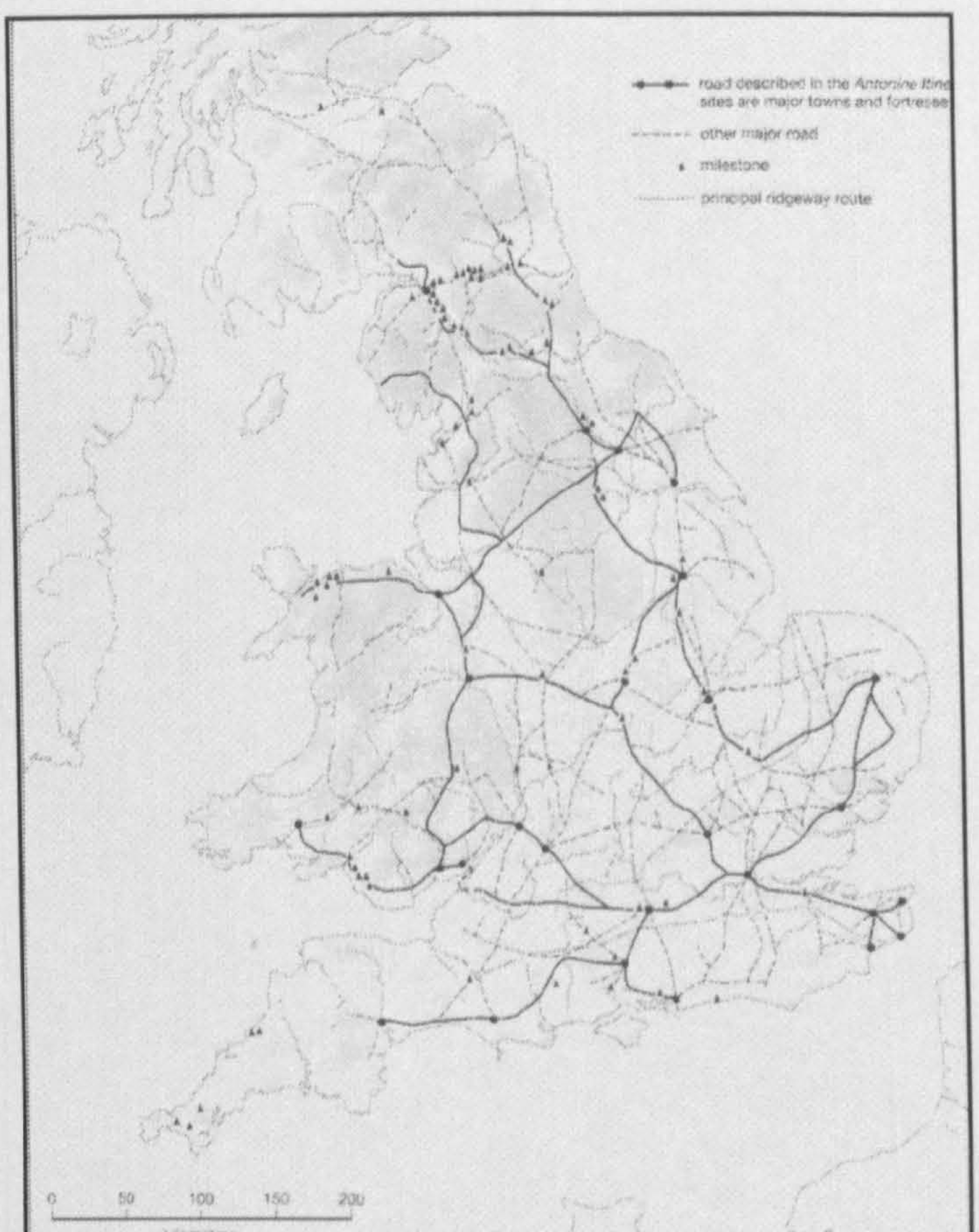


Figure 9.9. Main Roman roads and find spots of milestones. Since this map was produced an extension of the road system to the west of Carmarthen has been proved.

(Jones & Mattingly)

Military roads

The earliest roads in Roman Britain were constructed at an essential part of the campaigns of the army, and have been described as following "routes of penetration" (Jarrett 1994, 19) or "line of march" (Hanson 1987, 61). The purpose of such roads was to enable supplies and reinforcements to be brought to the frontline, and the supply bases behind it (see Chapter 4).

The Royal Engineers of the British army studied the resources needed by the Romans to build a road from the beachhead in Kent to the Thames at London (Davis 1984, 6-8; Peddie 1977, 188). This was based on the theoretical clearance of a strip of land 8.6 m wide, with a 2.6 m running surface down the centre, flanked by wooden kerbs. It was calculated that, with this light construction, a team of 1000 men could have constructed the road from Richborough to Westminster, in some 15 weeks, ensuring that the road-head was no more than two days to the rear of the advancing frontline. In order to build a fully-engineered road over the same route it was calculated that a team of 3400 men would have needed three years to complete it. Davies (2002, 114-5) has pointed out that such a light construction road, without any drainage ditches or metalling, would not have been passable in wet conditions, even allowing for the use of some corduroy timber over marshy ground, and that this type of construction would easily break down, particularly under wheeled traffic, and quickly become unusable at any time of the year. He considers it implausible that such a road would have been suitable to cope with large-scale military movements for a period of years. He therefore suggests an intermediate type of road would have been constructed, with drainage ditches and light metalling, if possible by the end of the relevant campaigning season. This would enable any forward fort to be supplied during the winter, and provide an adequate road for the field army to advance quickly from its winter quarters, at the start of the next campaigning season.

Fully-engineered roads

The capability of a road to carry traffic is determined by the width of land that has been metalled, using stone or gravel to construct a firm and well drained surface. An un-metalled road is thought by Pliny (*Ep.* II. 17) to be unsuitable for wheeled vehicles, as he comments that his villa at Laurentum could be approached on the main road from Ostia, but the final journey of six miles was over a side road, which he describes as "sandy for some distance and heavy and slow-going if you drive, but soft and easily covered on horseback". For fully-engineered Roman roads in Britain the average width of metalling is 6.51 m (22 *pedes*), and as Davies (2002, 73) has demonstrated that 15 *pedes* would be adequate to allow two-way wagon traffic, it is probable that the major Roman roads in Britain were more than adequate to deal with normal traffic flow. However, Margary considered that the broken mountainous terrain of much of Wales "rendered aligned roads out of the question" and that this led to the frequent construction of terraced roads, much narrower than normal and only some 3 m wide (1973, 315).

In discussing the steep gradients of some Roman roads in Britannia, Collingwood Bruce pointed out (1867, 76) that the Military Way to the south of Hadrian's Wall takes the easiest route that the wall and *vallum* permitted, but challenges wagon-drivers of his day to negotiate the still steep inclines with laden vehicles. At first sight this might refer to the problems of ascending a steep gradient, however, the main problem faced by wagoners would have been descending, rather than ascending, steep gradients because braking systems were primitive, or non-existent. Where a gradient exceeded 1 in 15, great care would be needed; and only on a surface composed of very loosely ground gravel could a slope steeper than 1 in 20 be descended (Davies 2002, 79). Gradients in excess of this exist on Roman roads, notably at Birdlip Hill on Ermine Street, between Cirencester (*Corinium*) and Gloucester (*Glevum*), where the natural gradient is 1 in 2, but by the use of zigzag diversion, the road has a gradient of 1 in 5, though there is a length of about 75 m with a slope in excess of 1 in 5. However, in the same way that additional horses, mules or hauliers could be used to ascend a steep gradient, similar forces, but in the opposite direction, could be used to descend the steepest of slopes.

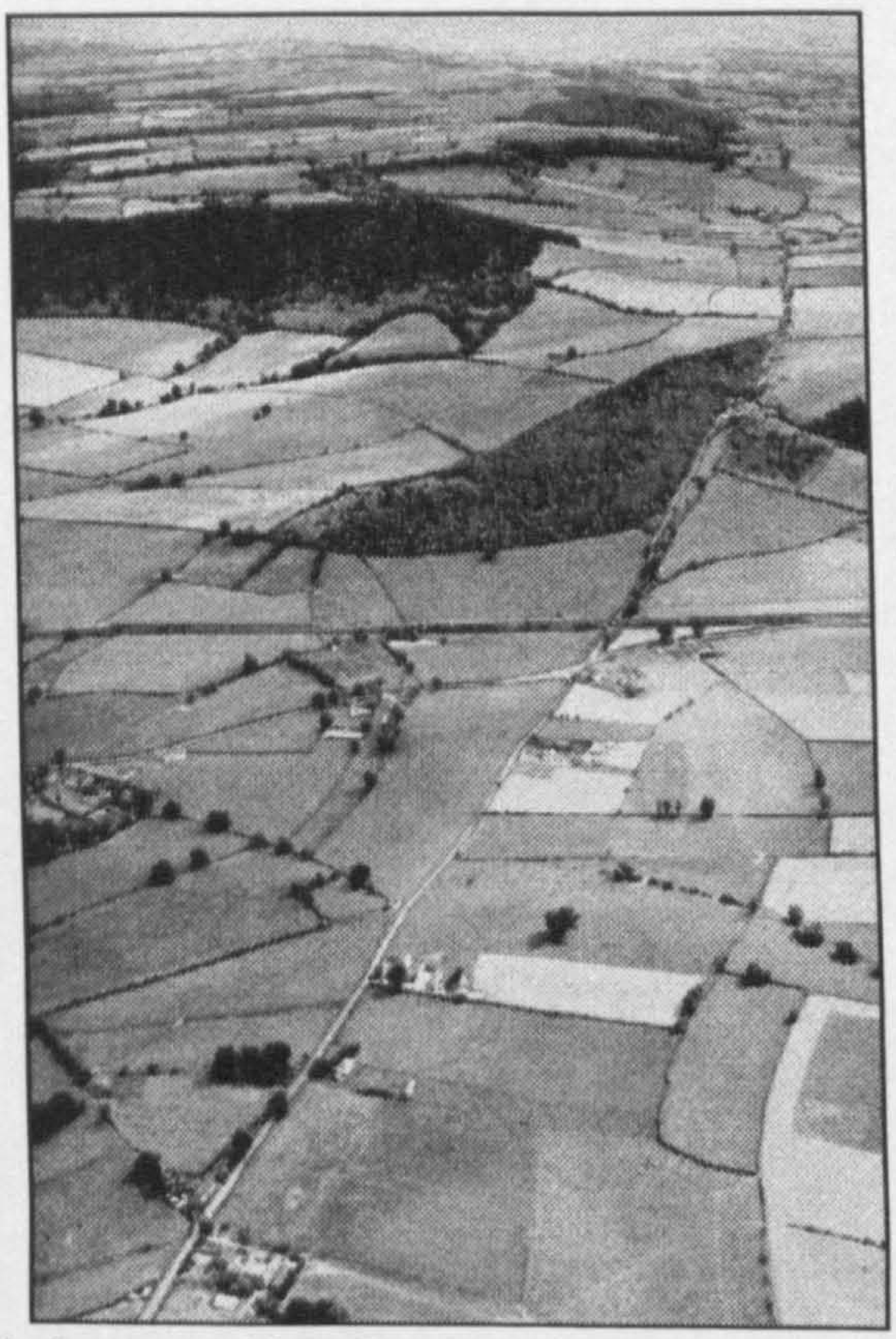


Figure 9.10. Roman road from Craven Arms to Leintwardine (Alan Roberts)

Local roads

Although these may have originally been constructed by the military, to serve a fort or supply depot, any new construction or repair and maintenance became the responsibility of the civilian authorities, usually working through the *ordo* (town council) of the *civitas* capital. For example, the military road originally built to serve the fortress at Caerleon would have declined in military importance by the early 3rd century and would have become (within their respective geographical areas) the responsibility of the citizens of the *civites* at Cirencester (*Corinium*), Caerwent (*Venta Silurum*) and Carmarthen (*Moridunum*). Minor roads were usually built by landowners for private use, to either connect various elements of a villa estate, or to link into a local road system.

Vehicles

The edicts of the Codex Theodosianus date from the late 4th century, but it is unlikely that the range of freight carrying vehicles had changed significantly from the earlier period. The edicts specified certain types of vehicles and imposed weight limits for their cargoes when travelling on the Imperial highways (8.5.30) The limits imposed upon four types of draught vehicles were as follows;

Post-wagon (*angaria*)	1500	Roman pounds	(490 kg)
Post-carriage (*raeda*)	1000	„	(325 kg)
Cart (*vereda/carrus*)	600	„	(200 kg)
2-wheeler (*birota*)	200	„	(65 kg)

Of the vehicles specified in the Codex, an *angaria* was a large four-wheeled vehicle drawn by 6/8 oxen, a *raeda* was a large four-wheeled vehicle drawn by 8/10 mules or horses, a *vereda/carrus* was a smaller four wheeled vehicle drawn by 4/6 mules or horses and a *birota* was a two-wheeled vehicle drawn by 2/4 mules. The speed that could be regularly maintained by these vehicles is estimated as 3.2, 4.8, 7.0 and 8.0 kph respectively (Kendal 1996, 141-3).

These restrictions do not represent the full load carrying capability of each vehicle and appear to have been imposed in order to minimise wear on the road surfaces. In cases of military necessity, and subject to suitable road surfaces being available, Kendal suggests that these loads could be increased by up to 75%, resulting in figures of 850 kg for the post-wagon, 600 kg for the post-carriage, 350 kg for the cart and 120 kg for the 2-wheeler. An Imperial decree from AD 368 lays down the maximum loads to be transported by vehicles of the *cursus clabularis,* created by Septimus Severus, and charged with the task of carrying provisions for the army (Kendal 1996, 141-3). Under the threat of severe penalties for exceeding the limits a load of 1000 lbs is specified for a carriage, 1500 lbs for a post wagon and 30 lbs for a posthorse. Greene (1986, 40) suggests that the stipulation of maximum loads in the Codex may have been intended to protect roads in the more mountainous regions of the Empire; this would have been applicable to many of the roads in Wales.

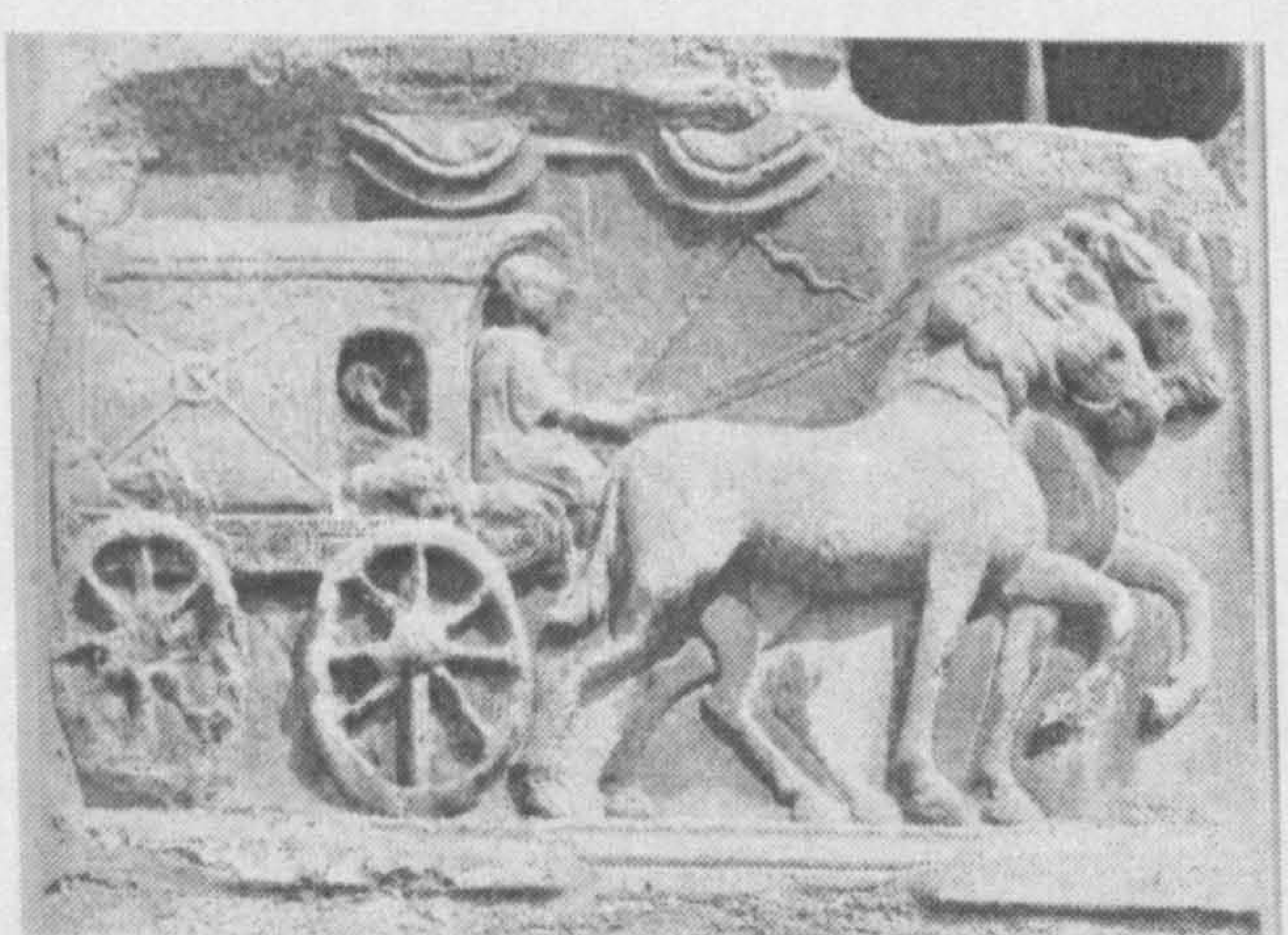


Figure 9.11. Relief from Maria Saul in Italy showing passenger transport carriage, similar to those used by travellers of the cursus publicus.

Restrictions on the size of loads are by no means confined to the Roman period. Charles II laid down that "no wagon, or waine, cart or carriage carrying goods for hire should be drawn up by more than seven horses or eight oxen or carry more than 20 cwt between October 1st and May 1st, or more than 30 cwt between May 1st and October 1st. In 1623 James I issued a proclamation stating that "no carter or other person whatsoever shall travel with any waine, cart or carriage with more than two wheels nor above the weight of twenty hundred; nor shall draw any waine, cart or other carriage with above five horses at once".

There are several references to the military wagons in the Vindolanda tablets; in one the commander of the 9th Batavians is told that steps had been taken "that wagons may be given to you" (315), and was advised in another (316), that you should "make up in your mind, my lord, what quantities of wagons you are going to send to carry stone". Another letter (309) includes a list of stores including "34 wheel-hubs; 38 cart-axles, one of them turned on a lathe; 300 spokes" (Birley 2002, 92-3).

Transport animals

The weight that could be carried by a packhorse was in the order of 100 kg; this compares with the ability of a pair of carthorses to draw a tonne. Obviously, a packhorse could travel on a track, whereas a wagon needed a road in reasonable condition. A mule has a greater load carrying capacity than a horse, its hooves are harder, its skin is tougher, and it can stand extremes of temperature better than a horse. The ox is docile, surefooted and very powerful, and was the main draught animal used in Roman Britain. However, it is extremely slow and can only cover a maximum of about 9.5 km per day when pulling a heavy load. Whilst this limited distance may occasion surprise, when Cato the Elder transported an oil mill from Suessa to his home in Venafrum, the journey took six days to cover a distance of 40 kilometres, averaging only 6.4 km per day (*Agri.* 20.3.3).

Land v water transport

In an address to the Royal Society in 1675, Sir Robert Southwell argued that "the principal use of the sea and rivers is for easier carriage of commodities". Comparing the cost of land and water transport, he suggested that the ratio between the cost of carriage by sea and by wheeled carriage was 1:20, and between inland water carriage and wheeled carriage it was 1:2. In addition he divided land carriage into two forms, and claimed that carriage by horseback accounted for 60% of the total land carriage, even though it was near to one-third dearer than carriage by wagon (Birch 1675, iii, 203 – quoted in Willan 1976. 1).

In his "Wealth of Nations" Adam Smith made a comparison between the cost of land transport and the cost of sea transport by writing as follows. "A broad wheeled wagon, attended by two men, and drawn by eight horses, in about six weeks time carries and brings back between London and Edinburgh near four ton weight of goods. In about the same time a ship navigated by six or eight men, and sailing between the ports of London and Leith, frequently carries and brings back two hundred tons weight of goods. Six or eight men, therefore, by the help of water carriage, can carry and bring back in the same time the same quantity of goods between London and Edinburgh as 15 broad wheeled wagons, attended by a hundred men, and drawn by four hundred horses". He concluded that "such are the advantages of water carriage it is natural that the first improvements of art and industry should be made where that conveniency opens the whole world for the market to the produce of every sort of labour" (1776, Book I: Ch. Xi., 20-1).

Cost comparison

Duncan-Jones (1982, 366-9) used the pricing edict of Diocletian to suggest a ratio of 1: 4.9: 28-56 for the relative costs of sea, inland waterways and road transport. This document includes information on several means of transport, and comparisons with the known costs of later periods indicate close agreement between the cost ratios between transport by sea, river and land from all periods. When operating beyond the Rhine, without the benefit of a developed road network, Kurnow has argued that the ratios would rise to 1: 5.9: 62.5 and that goods were likely to have been taken by water, from the Rhine around Denmark to the coast of North Germany, rather than eastward overland beyond the Rhine (1980, 21-3). It might be suggested that this would have been the situation for the army operating in Wales for much of the late 1st /2nd century AD. It should however be borne in mind that transport by land is "door-to-door", and that, for example, goods could be delivered direct to the specific location where it would be used. If transported by water it would be necessary to move the cargo to a landing place, load it on board ship or barge, transport by sea or river and unload at a landing place for movement to its place of use.

In the case of long distance transport, the relationship between the weight and bulk of goods and their value is critical. Transport of weighty and bulky goods of low value by land is extremely expensive, but the significantly lower cost of carriage by water makes the task economically viable. The classic example of this is coal, that in the 16th century, could be shipped economically from Newcastle to London, (54,742 tons were shipped in 1591-2), but could not be carried for any significant distance by land, as the cost of land carriage doubled the pit-head price every 10 miles or so. At Bath, during the 18th century, Tyne coal, coming 400 miles by sea and river, undercut Mendip coal that only travelled 12 miles by road. Weighty and bulky goods of high value, on the other hand could stand the cost of expensive land carriage even over long distances, and the classic examples of this are cloth and wool (Willan 1976, 1-9).

Transport of wheat

In the Edict of Diocletian (I.1 [wheat], XVII. 3 [transport]), the authorised charge per mile for a wagonload of 1200 lbs was 20 *denarii*; 60 *modii* of wheat weigh 1200 lbs; and wheat is priced at 100 *denarii* per *modius*. A load of wheat would therefore double in price if carried on a journey of 300 miles [(60 x 100) = (20x300) = 600)]. As a further example, a *modius* of wheat could be carried, for instance, from Alexandria to Rome, some 1,250 miles, for 16 *denarii*, a sum that would not pay for a land journey of 50 miles. It has been argued that grain, arriving in Rome from Egypt and Africa, would have undercut cereals grown in Italy itself, if they had to be transported by road (Yeo 1946, 241-2). In case of famine in an inland town, the local authorities had no resource other than to compel the local landowners to release their stocks; conversely, when the military units, which had hitherto consumed the local corn, were withdrawn from Lydia, the growers had no alternative but to let their crops rot on the threshing floor. Wheat seems, in fact, never to have been transported any distance by land, except by the Imperial government, for whom cost was not the prime consideration (Jones 1974, 37).

Transport by road

In comparison with carriage by water, land transport is expensive, but clearly goods were extensively transported by land. This is well illustrated by the movement of woollen cloth during the sixteenth century. The manufacture of cloth was the largest industry in the country, was widely dispersed, and dominated the export trade. One of the most impressive examples of land carriage is provided by the Kendal pack-horse men who took cloth to Southampton and returned with such imported goods as raisins and figs, madder and woad, alum and canvas. The round trips took just over a month, and it is significant that they were undertaken in winter as well as in summer (Willan, 1976, 8). Some cloth was sent by land when it could have gone by water. For example Norwich cloth could have gone down the Yare to Great Yarmouth for coastal transport to London. However, the more direct land route to the capital was taken. One of the advantages of land carriage is that it can be door-to-door. For example, an alternative to land carriage of cloth from Halifax to London would have involved a transporting of the cloth by land to the River Ouse, by river to Hull, by coasting ship to London, and by lighter from the ship to the London wharves. In view of the difference in distance between the land and water routes, dressed cloth from Shrewsbury did not reach the London export market by going down the Severn and round the South Coast. However, when Shrewsbury Corporation was buying grain for the relief of the poor, it brought wheat, barley and rye in Norfolk and arranged for it to be shipped by sea to Bristol, and then up the River Severn (Willan, 1976, 10-11).

Conclusion

We may obtain some idea of passage times, during the Romano-British period, by considering recorded voyages made in later periods, and some of these are detailed in Appendix 9. Since the Roman period there have been some changes in vessel design, notably the use of the fore-and-aft rig and a second mast; these led to some improvement in performance but, with sailing vessels it is wind, tide and loading/unloading cargo, not solely vessel capability, that are the dominant factors.

The case for the wide-spread use of water transport in the study area is well supported by an analysis of Maps 4.33-38 (reproduced here as Figures 10.1-5) in Jones and Mattingly (1990, 103-5). Of the 66 sites shown in the study area, 51 are on potentially navigable waterways, only 15 are unlikely to have been supplied directly by water transport (Figures 10.16-17 below).

. *Sites in the study area considered directly accessible by water transport*

Abergavenny	Clifford	Nantstallon
Abertanant	Clyro	Neath
Blackwardine	Cowbridge	Pen Llystyn
Brandon	Droitwich	Pennal
Brecon-y-Gaer	Erglodd	Pen-y-Gaer
Brithdir	Forden Gaer	Prestatyn
Buckton	Gloucester	Ruthin
Caer Gai	Jay Lane	Sea Mills
Caerhun	Kenchester	Stretford Bridge
Caerleon	Leighton	Stretton Grandison
Caernarfon	Leintwardine	Sudbrook
Caerphilly	Llandeilo	Tomen-y-Mur
Caersws	Llandovery	Trawscoed
Caerwent	Llanfor	Usk
Cardiff	Llansantffraid	Weston-under-Penyard
Carmarthen	Loughor	Worcester
Chepstow	Monmouth	
Chester		

Sites in the study area not considered directly accessible by water transport

Cae Gaer	Dolaucothi	Pen Llwyn
Caerau	Gelligaer	Pen-Min-Cae
Castell Collen	Hindwell Farm	Pen-y-Darren
Coelbren	Hirfynydd	Rhyn Park
Colwyn	Llanio	Y Pigwn

The preponderance of forts and settlements on the coasts, estuaries and navigable rivers provides an excellent case for supply by water transport. Wales, in particular, lends itself well to this method of provisioning, because of its long coastline, the isolation of the forts and the lack of an effective road system during the early campaigns.

Figures 10.12 - 15 show views of the Rivers Severn, Axe, Twyi and Usk and illustrate differing characters of the rivers of the study area. The Severn is shown at Caersws, the site of an important Roman fort, at an altitude of 124 m, some 300 km from the Bristol Channel. By contrast the Axe, on the Somerset Levels is at 4 m OD, the area being reclaimed from flooding by the construction of sea and river defences, during the Romano-British period (Rippon 1997a). The meanders at Llandeilo (25m OD) on the Twyi are indicative of a broad flood-plain, and a gentle gradient. A large pre-Flavian fort (Davies 2000,15) has recently been discovered near to the river. Again by contrast, at Brecon (125 m OD), the Usk flows in a constricting valley, and the water level shown is created by the town weir. If navigation to the long-lasting fort at Y Gaer took place, it would have needed a program of river improvement, and possible portages.

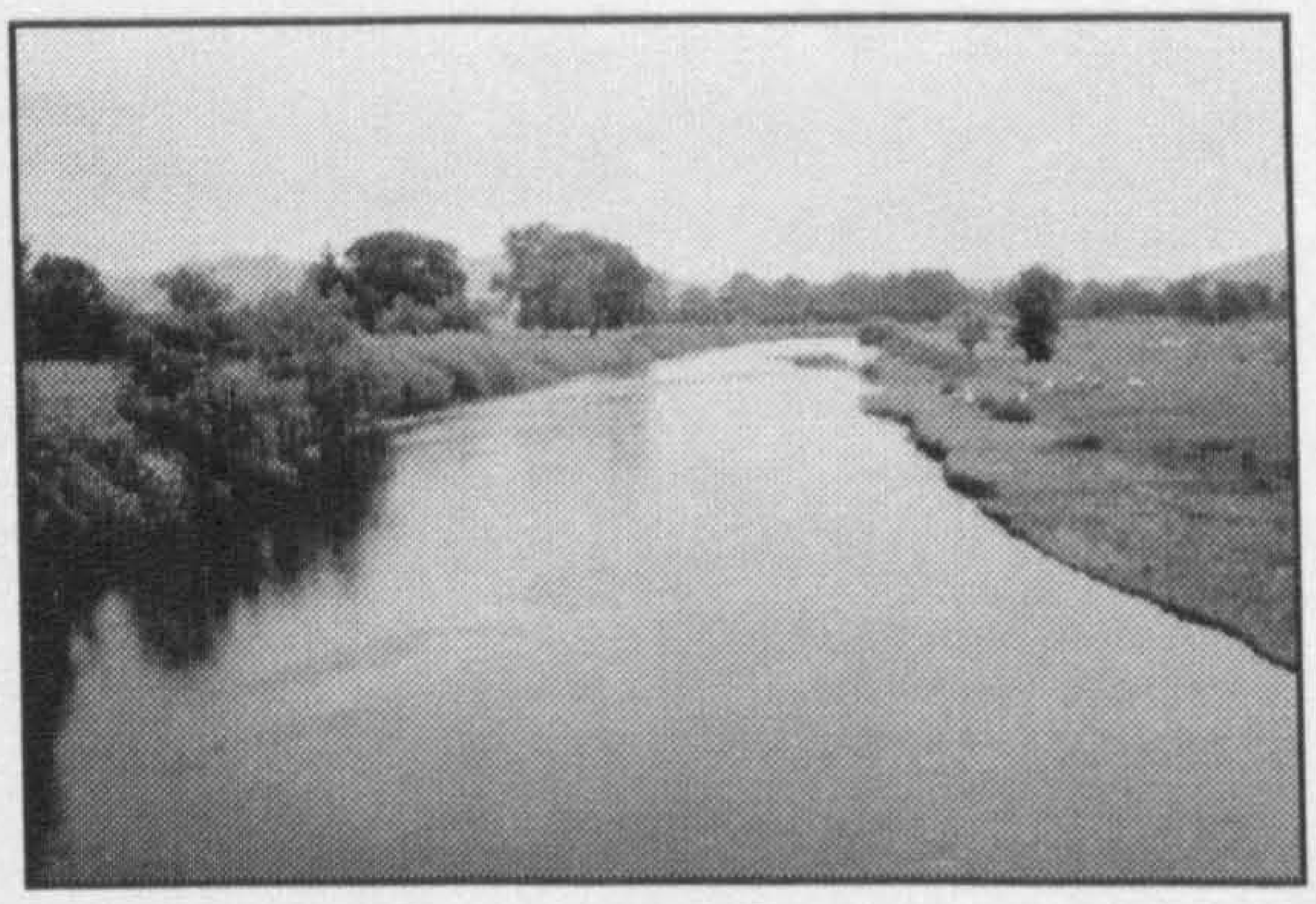


Figure 10.12. River Severn at Caersws.

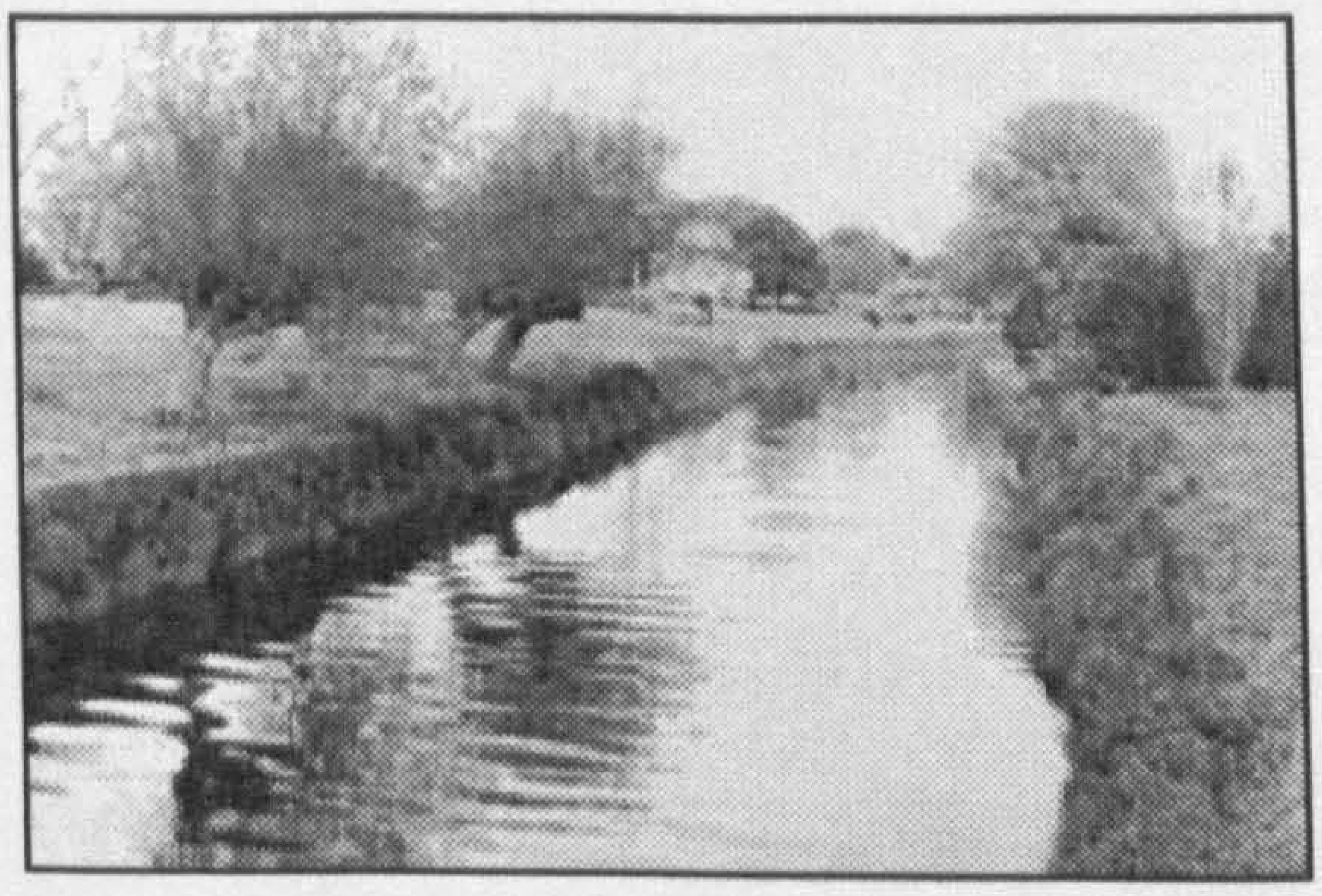


Figure 10.13. River Axe at Nyland.

Figure 10.14 River Twyi at Llandeilo.

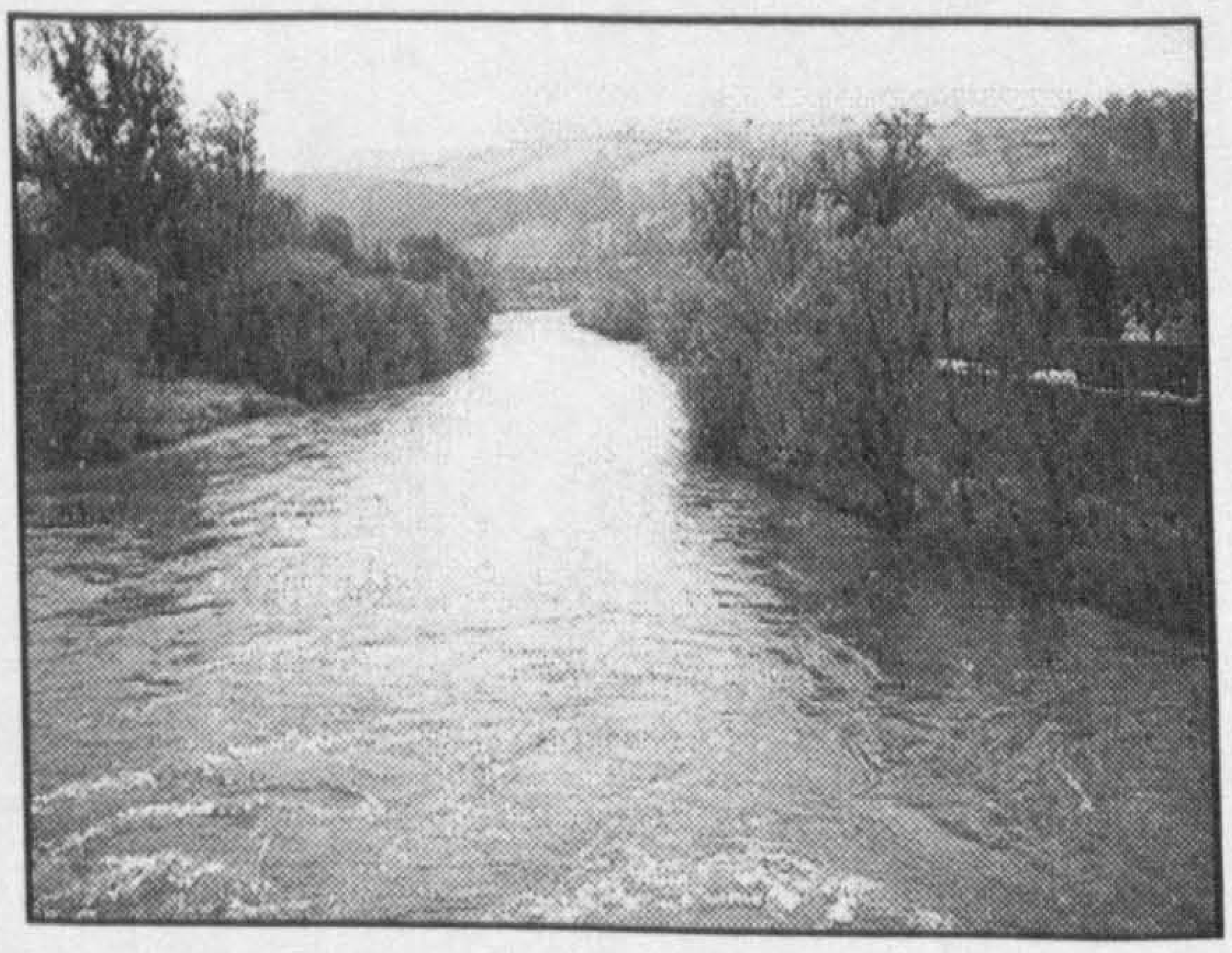


Figure 10.15. River Usk at Brecon.

Chapter 10. The size of the population

Introduction

Estimates for the population of Roman Britain have ranged from 1 million (Collingwood & Myers 1937, 180), through 2.8 millions (Fulford 1984, 131) to 4-6 millions (Salway 1981, 544). Millett (1990, 181 – 6) endeavours to provide better figures for England and Wales, but in the end, even he is forced to resort to a "mid- range" estimate of 3,655,000. He has also attempted to assess the rural, urban and military populations for the later Roman period and has arrived at mid-range figures of 3,300,000 rural (90% of total population), 240,000 urban (6.6%) and 125,000 soldiers + dependents (3.4%), indicating "a fundamentally agrarian society" (1990, 186). He comments that "The uncertainties make the range very large, although we can be reasonably certain that the real value lies somewhere within it" (*ibid.* 185).

Population is a major factor in any attempt to assess consumer demand, therefore the lack of precise data appears, at first, to present a major obstacle in assessing demand within the study area, and therefore the volume of traffic, whether by sea or by land. However, this thesis is not so much concerned with demographic patterns, as with patterns and volumes of shipping. If a demand based approach is adopted, the problem becomes slightly more manageable.

In order to assess demand, and subsequently the volume of shipping, it will be necessary to attempt some quantification of the consumption of commodities such as wine and olive oil, by the various sectors of the population. In order to do this it has been decided to use the military ration scales as a base factor, and to use this to modify the raw data for other sectors of the community. For example, as has been stated above, the fort of an auxiliary regiment of 500 men was closely associated with a *vicus* of approximately the same sized population. However, it is necessary to consider the number of women, children, servants and slaves, and to make due allowance for a smaller level of *per capita* consumption. Similar modifications are necessary for the urban and rural populations, and these are also detailed below. For want of a better term, the result is defined as "ration strength".

The rural areas

The 5th Edition of the Ordnance Survey of Roman Britain published in 1991 serves to illustrate the nature and scope of Romano British archaeology, with preference being given to villas rather than to less "interesting" dwellings. In an earlier section reference was made to the Wroxeter Hinterland Project, and had the results of this exercise been included, a further 16 villas would have been plotted in the Wroxeter area. It might therefore be argued that the current state of knowledge of settlement in many areas reflects the level of archaeological activity, rather than the complete picture of previous occupation. For example, in the upper reaches of the River Severn there is a virtually no record of Roman settlements of the size that would today be called a hamlet. It is most probable that this type of settlement existed, but leaves little or no trace in the archaeological record. Because of the perishable nature of the building construction, at the best, only traces of post holes are usually recoverable.

Certainly, many excavations of native settlements throughout the study area have produced evidence of some "Roman luxuries". For example, in the north, the enclosed hut group at Din Lligwy, on Anglesey, had a quantity of decorated Samian and later fine wares, including Oxford and Nene Valley products (Davies 2000, 113); in the south, the courtyard house at Carn Euny, in Cornwall, produced a Dressel 20 amphora fragment, Samian and Black Burnished ware, glass beads and rotary querns (Christie 1997, 27). By contrast, the large-scale excavation at the fortified farmstead at Walesland Rath in Pembrokeshire (Wainwright 1971, 84-8) produced just 22 sherds of Samian pottery, and fewer than 200 sherds of coarse ware (spanning three centuries). Native settlements were self-sufficient in agricultural produce, and the quantities of non-local pottery indicate supply at the level of travelling tinkers or, as there are many suitable places for beaching small vessels, some goods could have been supplied by itinerant traders. However, any luxury goods eventually reaching the settlements would have originally formed part of a "piggy-backed" cargo and, at any one time, are unlikely to have produced a significant increase in the volume of vessels involved in sea-borne traffic.

Villas, although perhaps accounting for less than 1% of the rural population (Millett 1990, 186), present a different problem as, when compared to the native settlements, the villas create a demand out of all proportion to their number of occupants. The difficulty of making any estimate of overall villa population is demonstrated by the contrast in size between the sumptuous villas at Woodchester (Clark, Rigby & Shepherd 1982) or Chedworth (Goodburn 1979), and the cottage type villas at Whitton (Jarrett & Wrathmell 1981) or Barton Court Farm (Miles 1984). Collingwood (1929, 261-76) estimated that the villas had an average population of 50, but Millett (*ibid.* 184) suggests that this may be an underestimate, "considering the enormous complexes which are now known to surround many". We also have little understanding of the composition of the villa population, for example, there is no evidence of the employment of slaves, although it is highly probable that they formed a significant proportion of the workforce.

However, as in the case of the native settlements, the villas were self-sufficient in agricultural produce, with many producing a surplus, therefore there was no requirement for the import of grain. As in the case of the native settlements, we are therefore left with the requirement for "Roman luxuries" as demand creation factors. Clearly, these items would be the preserve of the villa owner and his family. Garnsey & Saller have argued that most Roman families were nuclear, rather than extended, ranging between 5-10 persons (1987, 129,143). However, in the case of the larger villa estates, some senior employees such as bailiffs, farm managers and their immediate family should also be considered. For the small villas, a family of less than 8 is probable, rising to a maximum of 20 (family + dependents) for the larger villa estates. Bearing in mind that, in the study area, the majority of villas are of small to medium size, an average "ration strength" of 10 per villa seems reasonable.

For the study area, the 5th Edition of the Ordnance Survey of Roman Britain shows the following "Villas and other substantial buildings";

28 within 10 km of the English side of the Bristol Channel

40 on the Severn Valley and Marches

8 in the Forest of Dean

3 in North Wales

10 in South Wales

1 in Cornwall

The total of 90 needs to be increased to reflect so far undiscovered sites and an increase of 50% might be considered reasonable, giving a potential of 135 villas. As an indication of scale, an adult population of 6 persons per villa this would create a "ration strength" of 810, almost equivalent to that of two cohorts of infantry.

However, it has to be said that there is no archaeological evidence to support these suggestions. Tyers 1996 map showing the distribution of all amphora types in Britain shows, apart from military sites and urban areas, indicates evidence from only Carn Euny, Trethurgy and Carvossa in the Southwest, Cheddar, Tewkesbury and Meole Brace (near Shrewsbury) in the Severn Valley and Rhos on Sea on the North Wales Coast. This clearly does not reflect the consumption of wine or olive oil in rural area (including villas), but it does illustrate the difficulty of obtaining useful quantitive data, solely from the published archaeological record. For example, the writer has examined some 30 kg of Dressel 20 amphoras from an unpublished and ill-defined site, at Crandon Bridge on the South Somerset Levels, and there are undoubtedly many similar situations. The problem stems from the fact that until the 1980's, amphoras were given little prominence in pottery reports, and were usually reported without further specification or quantification (Parker 2003, *pers.comm*). That this situation still obtains has already been mentioned in connection with the excavation report on the Caerleon *canaba* where "it was considered neither useful nor economical of time and money to quantify the number of vessels by weight, or to attempt any statistical analysis of the quantities involved" (Evans 2000, 283).

The urban areas

Towns were an essential part of the Roman way of life, not only fulfilling a central place function, but also simplifying the tasks of administration and tax collection. By contrast, Iron Age society in Britain had revolved almost entirely around individual farms, hill forts and villages, with only comparatively few larger collective settlements (*oppida*). Wacher has suggested that one of the main achievements, by which the success of the Roman administration in Britain can be judged, was its ability to persuade a population, totally committed to a rural way of life, to accept the alien concept of urban settlements in its midst (1975, 36-7).

In attempting to assess the urban population, we have a reasonable idea of the area within the walls of defended towns and, in the study area, these are as follows;

Wroxeter	77 ha	Kenchester	9 ha
Gloucester	19 ha	Worcester	8 ha
Caerwent	18 ha	Leintwardine	6 ha
Carmarthen	12 ha	Droitwich	3 ha

The following significant Romano-British settlements were not defended by walls, so we do not have a precise indication of their area;

Abergavenny	Monmouth
Usk	Blackwardine
Sea Mills	Charterhouse on Mendip
Cowbridge	Weston under Penyard

There have been a number of suggestions for the calculation of the populations of urban areas. For example, based on the observed density of stone buildings in Silchester, Boon (1974, 61-2) proposed a value of 100 people/ha. Using the density of timber buildings at Neatham a figure of 283 people/ha. was suggested (Millett &Graham 1986, 154), whilst Rivet (1958, 89-90) suggested a figure between 62-185 people/ha. Based on the excavated remains, the estimated range for Pompeii was 123-184 people/ha. (Jongman 1991, 111). Given these differences, any estimate can only be considered as open to question. After considering various options, Millett decided to base his urban population estimate on the work of Hassan who, in his examination of demographic archaeology (1981, 66-7) based his estimates on the density of the old quarters of middle-eastern towns and their surrounding villages. He proposed a density of 137 people/ha.for villages, and a density of 216 people/ha. for towns. Hassan's figures will be here used to assess the degree of urban settlement in the study area, but adjusted to 150 people/ha. in order to reflect Millet's comment that "the average population density within the towns probably lay towards the lower end of the range, since Romano-British towns tend to sprawl rather than being densely packed (*ibid.* 182).

The walled town populations then become;

Wroxeter	11,500	Kenchester	1,350
Gloucester	2,850	Worcester	1,200
Caerwent	2,700	Leintwardine	900
Carmarthen	1,800	Droitwich	450.

For purposes of comparison, and using the same data, the population of Cirencester (97 ha.) becomes 14,550, that of Bath (9 ha.) is 1350, Whitchurch (3 ha.) is c.450 and Dorchester on Thames (5.5 ha.) is of the order of 825. We may perhaps question the figure for Wroxeter, despite recent geophysical evidence indicating a greater density of occupation than had been previously believed. White (1997, 139) estimated it as 8,000 at its high point. The extent of the earthen banks reflected the period of greatest expansion, and a considerable number of the structures seem to be of a temporary nature (White & Barker 1998, 71-5; White 2000, *pers. comm.*). By contrast, a larger population for Gloucester is probable, as the walled area is only that of the legionary fortress. Within the walls, Hurst (1976, 73) suggests there was a population of 3-4,000. He vigorously argues for significant settlement with a built up area of some 30 ha. lying outside the walls of *Glevum* (1999, 120-1). This is also the case at Chester, by a re-interpretation of the co-called Quay Wall as an extension of the defended area, for an increase of some 12.5 ha. (Mason 2002, 68-72). The populations for the un-walled towns, based on an estimated average area of 3 ha. and a density of 150 people/ha., are therefore in the order of 500 in each case. Again there is considerable scope for debate, with the population of Weston under Penyard probably greater, and that of Abergavenny probably smaller.

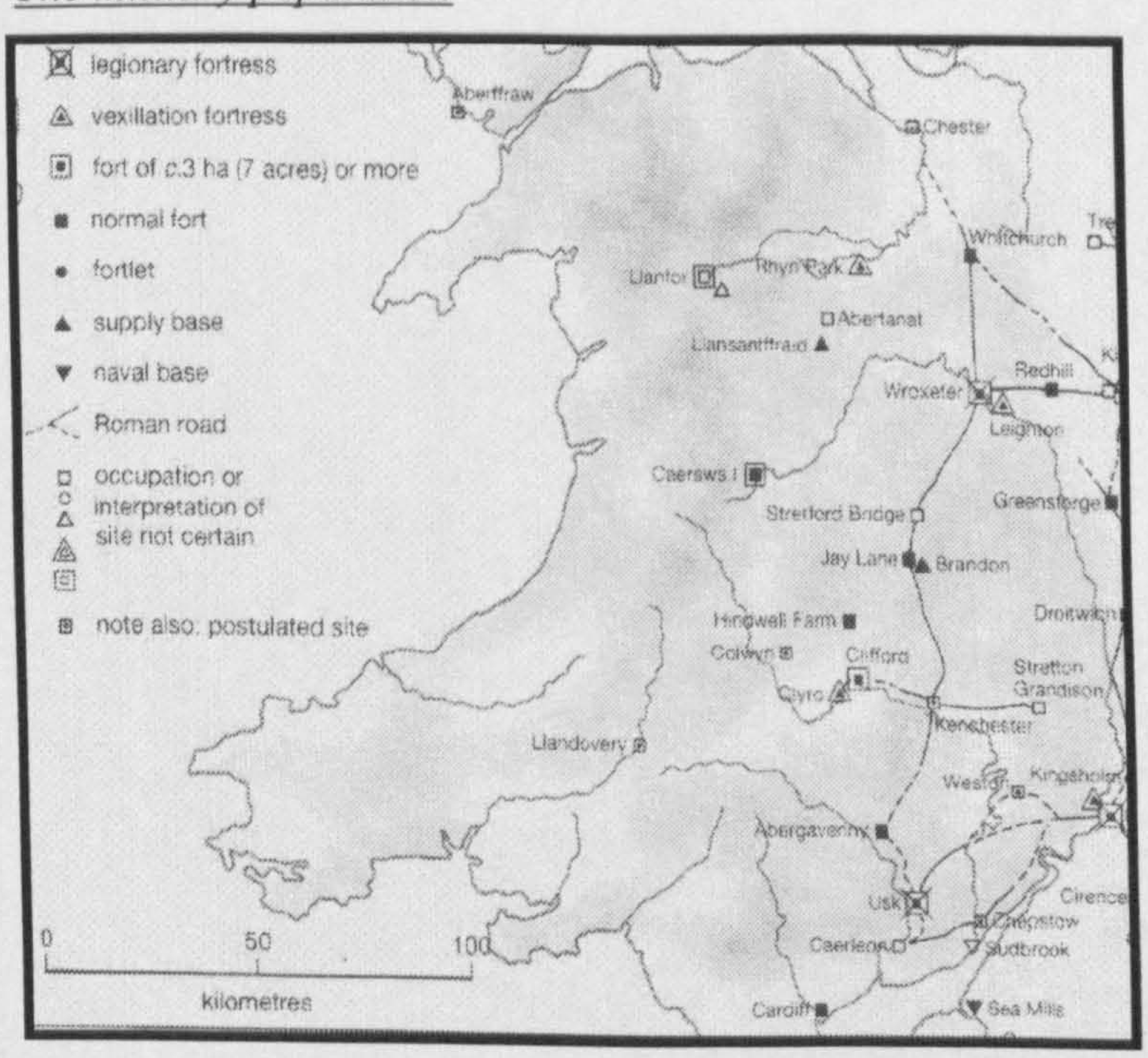
The total urban population of the study area therefore becomes c.26,000 (walled towns 22,750; un-walled settlements 3,600), and as the mid-point between Millet's maximum and minimum estimates for the whole of England and Wales lies at c.243,000, the proportion appears reasonable. Unfortunately, comparisons with present day populations only serve to confuse the issue as, for example, the site of Roman Wroxeter is now a small hamlet comprising a few houses and a "redundant" church, whereas Droitwich has a population of 25,000.

We need to establish the size of consumer demand within the urban areas and, once again, direct evidence, in the shape of amphoras, is missing. An extensive search of the literature failed to produce any results, and conversations with a number of Romano-British authorities failed to provide a solution. The possibility that building size would indicate status was considered and this might eventually provide a solution but, with the exception of Caerwent, the evidence is restricted to limited area excavations within urban areas. Geophysical survey (e.g. Wroxeter) or aerial photography (e.g.) Kenchester reveal the size of buildings, but it is only by examining the artefacts that a reliable indication of status may be obtained. Caerwent seemed a possibility, but Richard Brewer (2004, *pers.comm*) pointed out that, despite the extent of early excavation (Ashby *et al.*1901-13), there had been no well-published report on the finds, and therefore there was no reliable source of cross-reference. This is regrettable as, in contrast to the urban areas, some progress has been made on military sites, notably at the Antonine Wall fort at Bearsden (Breeze 1977, 133-6) and at the military *vicus* at Newstead (Jones, R.F.J. *et al.*1989-93). In particular, at Newstead, it has been possible, despite most of the extra-mural buildings being of similar size and construction, to demonstrate conditions ranging from "a relatively high degree of luxury" to "remarkably squalid environments" (Clarke 1994,72-82).

Turning to a period when written records are available, at York in the late 12th/early 13th century, there were 767 freemen out of a total population of over 8,000 (Pahl 1976, 12). Thrupp has calculated that, in 1501-2, there were some 3,400 citizens out of a total London population of 35/40,000 (1948, 51). In Southampton, some 30% of the population were too poor (worth less than £1 in goods and wages) to be included in the early 16th century assessments; 35% were identified as the employed working class (worth £1). A lower middle class (worth £2-10) made up a further 25% of the population; the middle class "proper" (£10-40) constituted 8% and the wealthy (more than £40) made up the remaining 2% (Platt 1976, 107-11). These figures are not dissimilar to the ratio of suggested Roman family to estate worker, probably in the range between 1:8 and 1:10 and, in the absence of better information, a figure of 10% of the urban population, as significant consumers of olive oil and wine, will be used.

At this stage one is forcibly reminded of Richard Reece's scathing comment that "It probably does not matter that your house of interpretation is built upon sand, because if the foundations are undermined by proper research you will simply shift your castle into the air, where it will be safe from all attack" (2002, 69). It has to be accepted that, so far, this section has been based on very limited evidence, the opinions of others, and the interpretation of the writer. Fortunately, from this point onwards, we are on firmer ground, with some historical sources and, more importantly, much better quantifiable and datable archaeological evidence.

<u>*The military population*</u>



<u>*Figure 10.1 Wales and the Marches: pre-Flavian*</u>

<u>*(Jones & Mattingly)*</u>

These forts and fortresses (Gloucester, Usk and Wroxeter) were established between AD 47-61 during the campaigns of Osturius Scapula, Didius Gallus, Quintus Veranius and Suetonius Paulinus. The conquest was interrupted by the revolt of Boudicca (AD 61). The possible final conquest of Wales was prevented by the withdrawal from Britain of the 14th Legion for Nero's intended war against the Parthians.

Clearly, not all forts were occupied at the same time, but the garrison from this time, up to the early-Hadrianic period (c. AD 125), comprising two legions and twenty auxiliary regiments remained constant. The military garrison of Wales has been estimated at about 20,000 which, with a native population of c. 200,000 to c. 400,000, implies a population increase of about 6 to 12%, due to the presence of the army alone (Jones, M. 1984, 43).

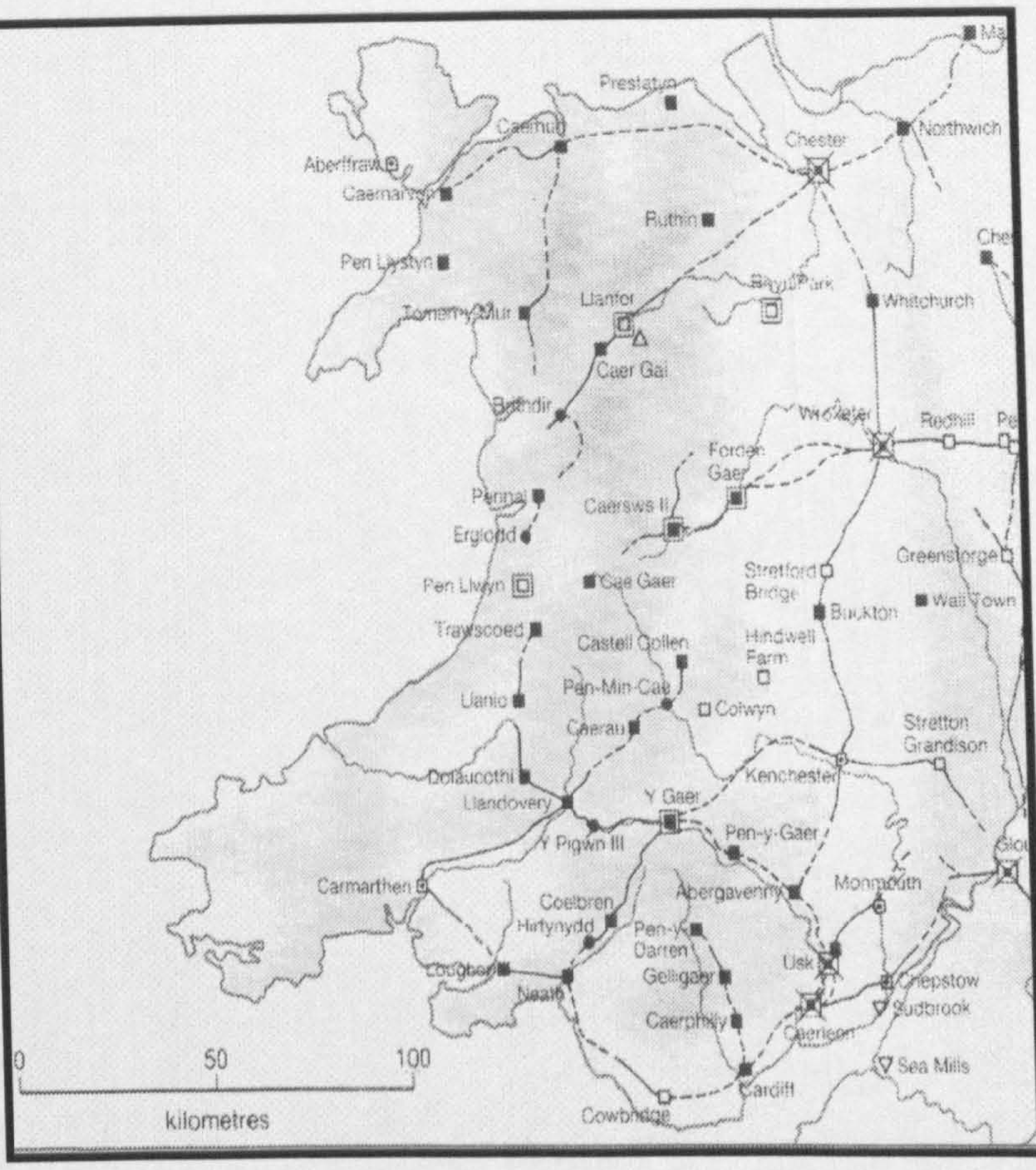


Figure 10.2 Wales and the Marches: early Flavian c. AD 74-80 (Jones and Mattingly)

The arrival of Petillius Cerialis, with the 2nd Adiutrix Legion, enabled the resumption of the conquest of Wales. Julius Frontinus completed the advance to the west coast, rationalized the military dispositions, and constructed new forts in conquered territory. Julius Agricola completed the final "mopping up" operations and carried out some fort construction in West Wales. Permanent legionary fortresses were established at Caerleon and Chester.

The Flavian period represents the greatest density of military sites, with some earlier sites in the eastern areas being retained as rearward transit and supply depots.

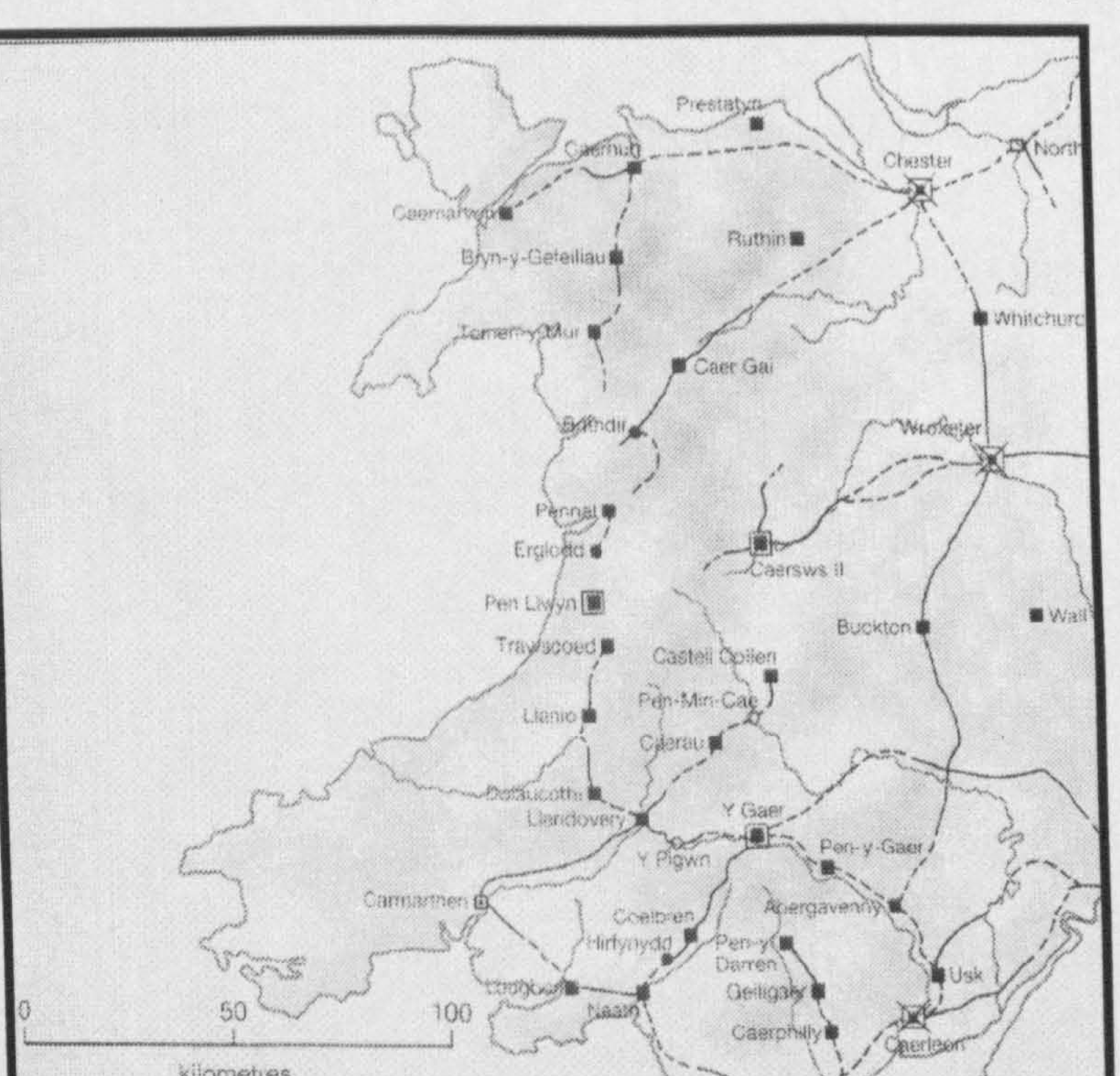


Figure 10.3 Wales and the Marches: Trajanic-early Hadrianic c. AD 100-25 (Jones & Mattingly)

With secure lines of communication having been established, it was possible to close all non-essential forts. The function of the garrison became that of control and consolidation, rather than direct military intervention. A fully developed system of engineered roads now existed, and supply and replenishment by sea was well developed.

The switch from an offensive deployment in the Flavian period, to the blanket policing garrison imposed after the conquest of Wales was completed is demonstrated in this map. The success of the policy is demonstrated by the further reduction of garrison shown on the next map.

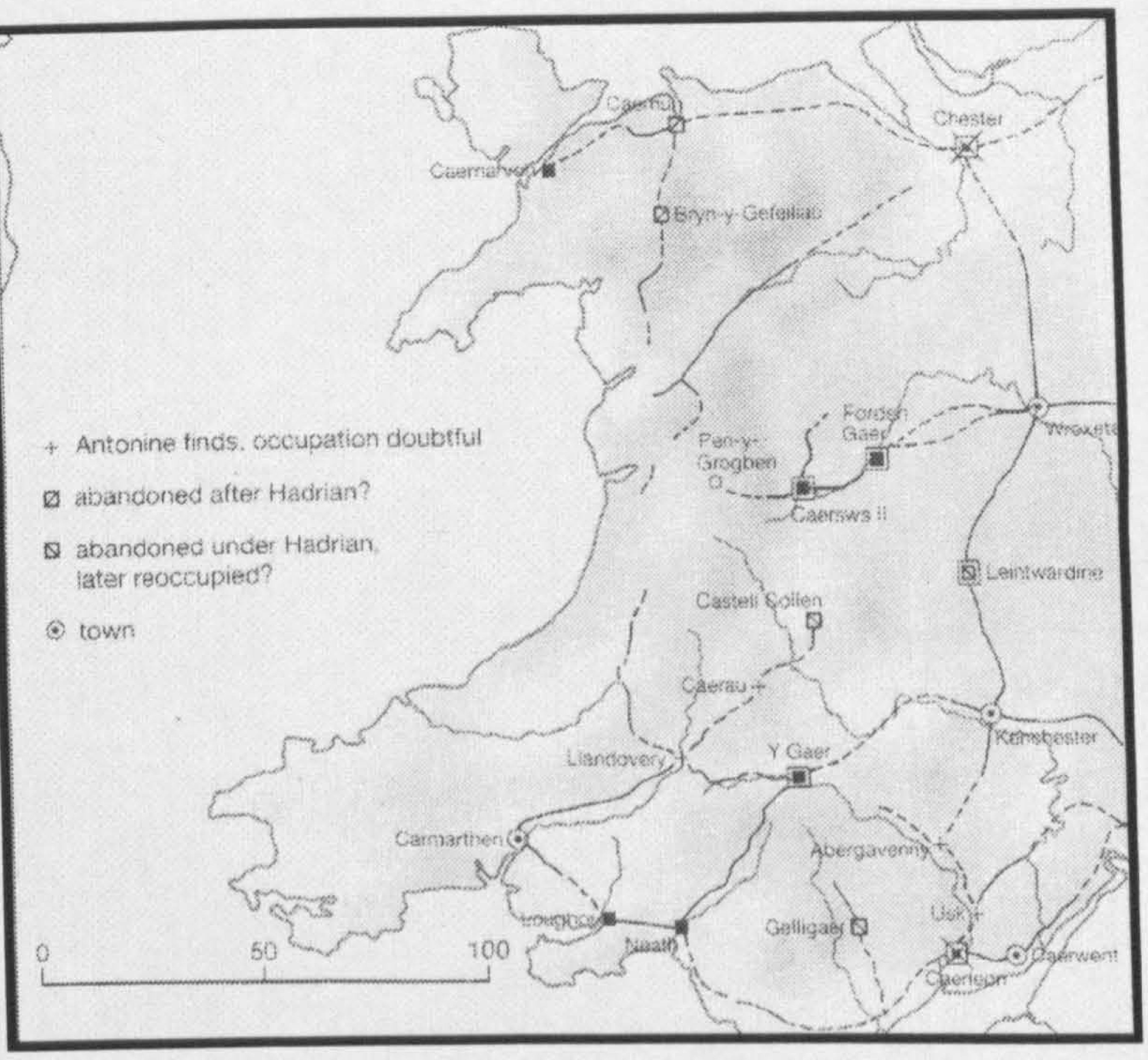


Figure 10.4 Wales and the Marches: Hadrianic-Antonine c. AD 125-65 (Jones & Mattingly)

Units from Wales had been regularly detached to support campaigning on the northern frontier. The establishment of static defensive lines at Hadrian's Wall, then at the Antonine Wall required further troops for both construction and garrisoning and many of the Welsh forts were de-commissioned.

Figure 10.5 reflects the effect of the dramatic effect of the reduction in the Welsh dispositions. Of the auxiliary forts, only Caernarfon, Caersws, Forden and Brecon Y Gaer retained long term permanent garrisons. The forts at Loughor and Neath were physically reduced in size before abandonment c. AD 130, followed by a brief period of re-occupation some 20 years later. A further reoccupation of both forts took place in the late 3rd century with the latest evidence for occupation being a coin of Constantine II as Caesar (AD 324-330). A similar pattern is observable at Caerhun.

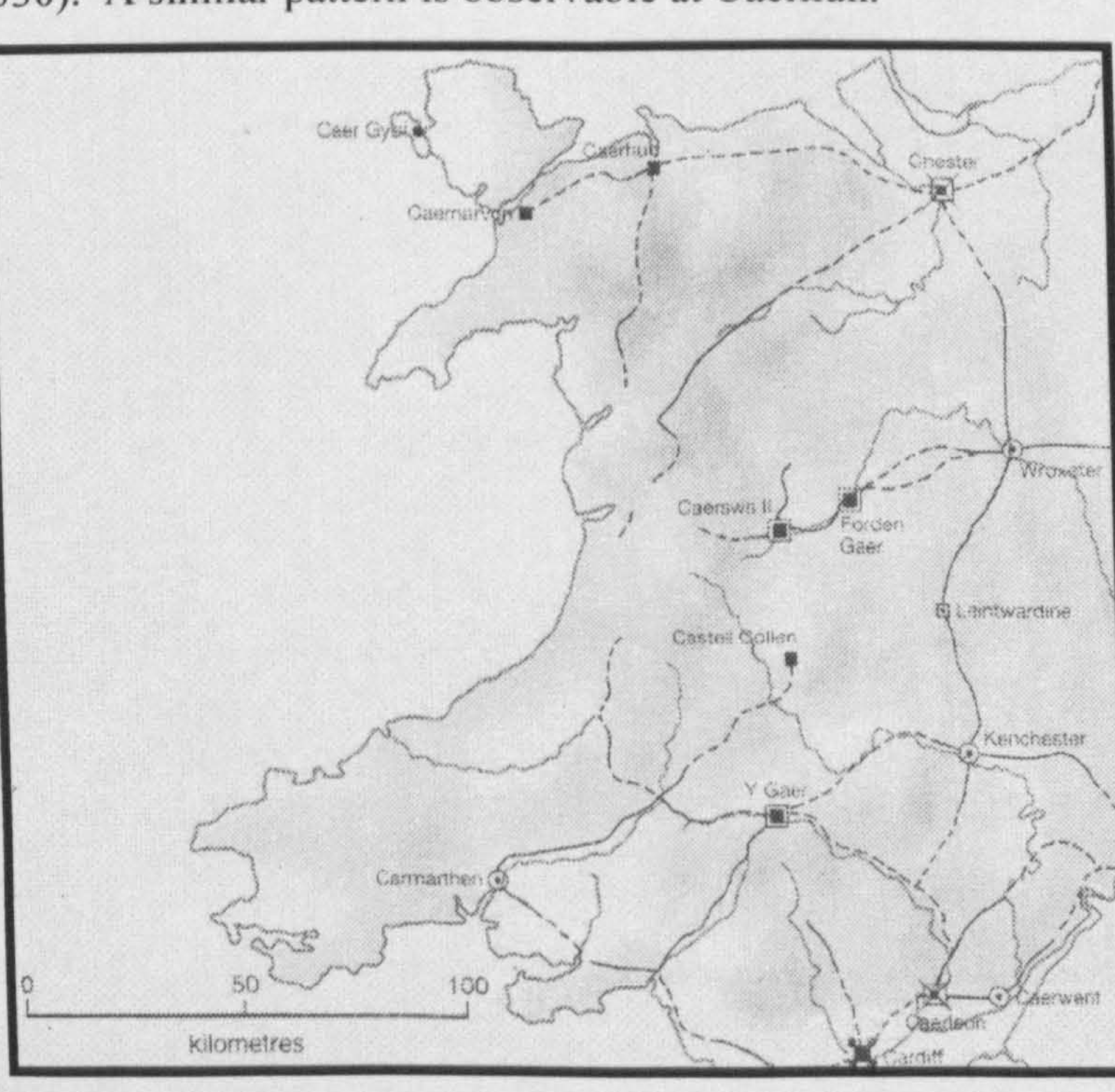


Figure 10.5 Wales and the Marches: Fourth century AD

The general pattern created in the mid-2nd century remained in place until the late 3rd century. The fort at Caerhun was decommissioned and then re-occupied, and this was possibly the case at Y Gaer. In response to a threat from the sea a Saxon Shore type fort was built at Cardiff, a small fort/harbour at Caer Gybi on Anglesey.

Although there is evidence that both the 2nd and the 20th Legions returned to their bases in the late 3rd century, the auxiliary regiments did not. The size of units was also much reduced and, by the early 4th century, Tomlin suggests that the strength of a legion was only about 400 soldiers and that of a cavalry unit was much less than 100 (2000, 172). At Caernarfon, a coin of the Emperor Theodosius 1st (AD 379-95) suggests that the fort remained in use until the end of the 4th century. From that time, no gold or silver coins were being shipped in to Britain, the state was no longer paying its servants, the single most important of these was the remnant of the Army but, "Cease paying the soldiers and the soldiers will, in due course, cease to be soldiers" (Cleary 1989, 140).

These variations over time clearly resulted in major changes in demand, and consequently the volume of shipping, and this topic is returned to later in this chapter.

The Army's civilians - canabae and vici

Civilian settlements were established outside the forts and fortresses of Britain and the population of these areas was similar to that of the parent military establishments. The settlement outside a fortress was known as a *canabae*, the term *vicus* was used for a settlement outside a fort. However, as Salway (1991, 591) has pointed out, the term *vicus* can be used indiscriminately of a village, the settlement outside a fort, a ward of a city, or even as a subdivision of a *canaba* of a legion. To avoid possible confusion, the term "military *vicus*" will be used. As their prime source of revenue, the activities of the inhabitants were directed to the demands of the soldiers, either as suppliers of goods and services, or as common-law wives of the soldiers. As such, they acquired (or brought with them) Romanised tastes and patterns of consumption, and therefore, they create a significant demand for a wide range of products. In these terms, it is suggested that the *canabae* were the probable equivalent of a major town similar to Caerwent, the military *vici* similar to a small town such as Kenchester.

Haverfield (1920, 141) suggested that the capacity of military granaries could have provided a source of grain for the civilian inhabitants of military *vici*, but Sommer (1984, 13) considered it unlikely that this was the case. However, no evidence for a granary has been found within a military *vicus* in Britain, and as the civilian population (similar in size to the garrison) would have created a demand for grain, it may be that Haverfield was correct. It was certainly in the interest of the military to encourage a thriving civilian presence nearby, and not only for commercial reasons. When units ceased to enlist new soldiers from their areas of origin, the *canabae* or military *vici* became important sources of recruitment (Breeze & Dobson 1978, 193).

Canabae

At Chester, as was the case at other legionary fortresses, a *canaba* was established in the immediate vicinity of the fortress itself, with land and facilities being set aside for the considerable number of civilians, whose presence was positively encouraged. Traders (*negotiatores*), merchants (*mercatores*) and sutlers (*lixae*) supplied the garrison on a contractual basis, as well as providing commodities and luxuries to the individual soldiers. Taverns, brothels and gambling houses, catered for some of the off-duty activities of the legionaries, but another (and more respectable) group, that provided a significant proportion of the community, consisted of common-law wives. After their 20-year period of service, legionaries would have retired and some married local women, legitimising previously informal unions and settling in the area. At Caerleon, extensive areas of civilian settlement have been identified to the east and west of the fortress, and a grid system of roads is evidenced by streets at right angles to the *via principalis* on both sides of the fortress (Evans *et al.* 2000, Fig. 125. 492-3). However, the excavators have felt unable to determine the total area covered, because of the unknown effects of erosion, and the limited areas so far excavated In terms of the economic aspects of the settlement, there is archaeological evidence for iron smelting and smithing, and the excavators suggest areas of subsistence farming on the fringes of the *canaba* (*ibid.*, 487-505).

It was common for a civilian community of urban form to be located within a few km of the fortress itself and this was, for example, the situation at Caerleon, with a significant settlement established at Bulmore. In the case of Chester, the settlement was located at Heronbridge, with the majority of buildings being strip houses set at right angles to the main road running south to Whitchurch. Excavations have demonstrated that occupation commenced c. AD 90 and continued down to at least the middle of the 4th century, with metalworking, the processing of grain and retailing, forming important elements in the economy. A less prosperous community, with crudely constructed buildings set in fenced and ditched enclosures, developed at Saltney and the probability is that it existed in order to supply the fortress and *canaba* with agricultural products (Mason 2002, 53-4).

Military Vici

Sommer (1994, 50) and has argued that the initial settlers of a military *vicus* were "camp-followers", closely linked to the incoming unit and that, in the case of forts held for only a short period, the *vicus* was abandoned at the same time as the fort. This seems to be the case in the "Highland Zone" of Wales, as it was only at Abergavenny that a town-like settlement developed from a military *vicus*. By contrast, in the Lowland Zone, several significant settlements developed, for example at Monmouth, Stretton Grandison, Leintwardine and Kenchester, with civilian occupation continuing for several centuries. Droitwich, Pumpsaint and Charterhouse are considered special cases, as the military presence was concerned with the control of the mineral resources, and Sea Mills also falls into this category because of the port operation. This may also be the case in the apparent reoccupation of Loughor and Neath.

There is some archaeological evidence for the activity of traders (*mercatores*) operating within military *vici*. There was a *taverna* at Greta Bridge (*Britannia* 6. 1975. 235), a probable butchers shop at Chesterholm (Birley 1977b, 40), at Castleford, unworn piles of Samian ware and *mortaria* suggest a pottery shop (Breeze 1977, 143), there is evidence of metal working at Carmarthen (James 1981, 11). As was the case in the legionary fortresses, important components of a military vicus were the prostitutes (Appian *Iber.* 85) and it is probable that several of the buildings housed a brothel.

Size of vici/canabae population

Eric Birley attempted to assess the number of "soldiers' women" in the military *vicus* at Housesteads on the basis that, in the mid 2nd century AD, 40% of military *diplomata* of auxiliaries record an existing relationship with a woman. Using this as a criterion, he calculated the population of the military *vicus* of a *cohors quingenaria* (480 soldiers) as around 2000 (1973, 15). Pointing out that if this applied to veterans, a significantly smaller ratio would apply to serving soldiers, Sommer suggested that a developed military *vicus* would have a population "slightly smaller than the garrison or less" (1984, 32-3). As a result of the extensive excavation of the military *vicus* at Vindolanda, Robin Birley suggested a population of 500-800 for Vicus I (AD 163-245), and a population of 800-1500 for the much larger Vicus II (AD 270-350). Robin Birley concluded that the life-style of the *vicus* inhabitants was "certainly comparable with that of the soldiers within the fort" (1977, 71-2). The extensive settlement outside all four sides of the fort at Newstead led Clarke (1994, 72) to suggest a population of between one and two thousand. Whilst Birley's and Clarke's estimates are based on an in-depth knowledge of Vindolanda and Newstead respectively, Sommer's work covered all the known military *vici* in Britain, and as such might be considered more representative of the wider picture. However, much of Sommer's research was based on excavations carried out some time ago, for example, his entry for Newstead is based on Curle's excavations of 1911, and at Caerhun, where recent geophysical survey has revealed extensive settlement, he relied on the 1938 excavations of Baillie Reynolds. This is not, in any way, to denigrate the quality of Sommer's research. It is simply that up-to-date excavations are in short supply. It is therefore intended to use the later data, and work on a military *vicus* population equal to the unit strength.

Civilian demand

When considering civilian demand, the amount of grain, wine and olive oil (the principal "imported" items) consumed by women and children would be much less than that of a soldier. Therefore, the quantity for the civilian element needs to be reduced. A suggestion, and it is no more than that, of a "ration strength" equivalent to 20% of the parent garrison seems reasonable. In the case of the *canabae*, a higher standard is probable, as the rate of pay of a legionary was perhaps twice that of an auxiliary. After completion of service, a legionary soldier was entitled to a discharge grant of up to ten times his annual pay (Webster 1981, 264-8) and, if settling in the vicinity of the fortress, would have given considerable purchasing power. This comparative affluence is demonstrated at both Chester and Caerleon in the form of public buildings, such as temples and bath houses, and private dwellings with colonnades, painted wall-plaster and mosaics (see Appendix 1). For the purposes of assessing demand, a "ration strength" of 30% of the legion is suggested. It is clear that civilian demand will fluctuate in roughly the same proportion as the military strength in garrison, whether permanently reduced, or absent on detachment, and this will need to be taken into account.

Conclusion

Davies observed, without being flippant, that the "most significant episode in the history of Roman Wales was the departure of the Roman army". This comment was made in the context of the fact that, by the close of Hadrian's reign, a large scale military presence had ended. By the later third century the auxiliary garrison comprised 2-3,000 men at most, and the much reduced legionary fortresses at Caerleon and Chester remained "as monuments of military inertia" (1984, 93). Even the figure for the auxiliary forces seems too high, a total of 1000 might now be considered more realistic.

The population of the study area at the early 2nd century might be estimated as follows;

Rural	150,000
Urban	26,000
Villas	2,500
Fortresses/forts	20,000
Canabae/vici	20,000
Total	218,500

By the early 4th century, although there had been only a relatively small increase in population, the composition had dramatically changed, and might have been;

Rural	200,000
Urban	18,000
Villas	10,000
Forts	1,000
Ex-canabae/vici	2,000
Total	231,000

As has been emphasised previously, there is only limited evidence to support these estimates and, to quote Henry Hurst commenting in another context, it has to be accepted that the data on which they have been based may be "being pressed to levels of interpretation which they cannot entirely take" (Hurst 1985, 121).

Chapter 11. Demand, supply and the volume of shipping

Introduction

From the mid 1st to early 4th century, the army played a predominant role in the British economy. Army units on the frontier zones, and at strategic positions along the lines of communication, created not only a series of micro-economies in the immediate environs, but also created an economic "pull through" effect. Middleton (1979, 91) argues that long distance trade was dependent, indeed parasitic, upon official supply lines, and was almost certainly directed to the needs of the military market, which was the goal of these supply lines. He comments that there is no evidence that the civilian market generated long distance trade and suggests that growth is likely to have been "generated in areas touched by the nozzle of the military vacuum cleaner, sucking supplies to the frontier". The establishment of a large standing garrison of Hadrian's Wall required the regular long distance shipment of food supplies from the grain growing areas of the south and, as this is a period at which the earliest instances of large-scale, long-distance, distribution of British pottery fabrics to that area occur, Middleton considers that this "is no coincidence" (1979, 94). Regulation, rather than the market forces, governed "official" supplies to the military, but market forces covered the provision of "unofficial" supplies, though these market forces were parasitic on the officially stimulated trade routes. Jones considered that long-distance trade of bulky and relatively inexpensive commodities, such as grain, to a civilian area was profitable, only when both of the production area and the market for the grain lay close to a port or navigable river (1973, 845). However, the provision of grain to forts was essentially a military necessity, with the costs being borne by the state, and even if the supply had been left to private enterprise, rather than to an official system, economic factors would not have been the over-riding consideration.

Whatever the level of demand, it is only relevant if a suitable source of supply is available. For example, Iberia apparently ceased to export olive oil in the later 3rd century AD and, in the Mediterranean, this was mirrored by an increase in a rise of imports from North Africa. In Britain, the remains of amphoras from Tunisia found, for example, at Caerwent, Gloucester and Cheddar, are insufficient to compensate for the absence of the Spanish product, and the use of olive oil must have declined during the later Roman period (Tyers 1996, 72).

The last section of this chapter will focus on the volume of shipping and, although based on a series of estimates, is intended to demonstrate not only the approximate numbers of vessels involved, but also the significant variations in volume that took place during the course of the Romano-British period.

Changes in patterns of living

Changes in population size are obvious but, during almost 400 years of Roman rule, many changes in the pattern of living must also have occurred; some of these are detectable in the archaeological record. For example, Walthew suggested that villas were more advanced in planning, construction and decoration than town-houses until roughly the mid 2nd century and has argued that, for example, it is difficult to conceive of a Silurian noble occupying the simple strip-houses of Caerwent. He suggests that most of the private buildings in the towns were either commercial or manufactories, and that the nobles continued to live on and invest in their country estates (1975, 189-205). By the middle of the 2nd century, substantial villa-type houses began to appear in towns, this has implications for changes in the rural/urban patterns of demand. The inhabitants of the stone houses of the mid 2nd to mid 3rd century military *vicus* at Chesterholm (*Vindolanda*) "possessed all the material comforts of Romanisation", including much imported pottery. On the other hand, in the wooden houses of the succeeding *vicus* (c. AD 270-350), coinage was scarce; pottery was markedly inferior and usually of local manufacture (Birley 1977, 71-2).

Geographical and social diversity was observed by Timby (1999, 40-1), who examined whether Gloucester, as a *colonia* with an established population familiar with Roman culinary habits and vessel-forms, had a different pottery assemblage from contemporary rural sites in the area. Frocester, Uley, Brockworth, Birdlip, Cowley, Kingscote and Uley were considered and the later 1st and early 2nd centuries show a greater diversity of traded wares and continental imports in the *colonia*. For example, Samian ware accounts for 6% (by weight) of the Berkeley St assemblage, but is less than 1% at Frocester Court. In the later 2nd- 4th centuries the assemblage at Gloucester became less distinctive, sharing the same wares as the nearby sites mentioned. In the later 4th century, Gloucester alone seems to have received imports, presumably by seaborne coastal trade.

Changes in taste

Occasionally, changes in taste may be observed in the archaeological record. In the report on the 4th century town houses at Beeches Rd, Cirencester, the excavators comment on the virtual absence of Oxfordshire ware drinking vessels. They point out that this is "in marked contrast to earlier periods when beakers and flagons were much in evidence" and suggest that this indicates a fall in wine consumption, in comparison with earlier periods (McWhirr *et al.* 1986, 175).

In the case of the army, with the possible exception of the Batavians who continued to recruit from their homeland in the Netherlands, established auxiliary regiments invariably drew replacement recruits from the nearest convenient source. Within a generation of a regiment moving out of the area in which it was raised, its ethnic/tribal identity became meaningless (Mann 1963, 147). By the 3rd century AD the frontier troops (*limitanei*) would have become almost entirely hereditary, since sons of soldiers were regularly recruited (and from AD 313 were obliged to serve [Jones 1973, 615]), so the taste for Mediterranean styles of food, including olive oil, may have gradually declined. The army was increasingly paid by requisitions in kind from the local economy (*ibid.* 623), and so the availability of cash for soldiers to buy luxuries declined, thus reducing the opportunities for overseas traders to operate in the Province.

Patterns of demand

A major problem in Romano-British literature is that almost four hundred years of Roman rule are often treated as a homogeneous period. However, the data needs to be placed in a tighter chronological framework, if it is to have any real significance. A breakdown by century is too small to reflect the changes that may take place, but a division by decades is too precise to reflect the imprecision of our methods of dating. It was therefore decided to follow the numismatic divisions proposed in 1991 by Reece (1991; 1995, 179-206; 2002), and now generally accepted as a sound basis for comparisons over time (summarised in Appendix 8). This event-driven chronology has been chosen as it does, at least, relate to historical periods, rather than calendrical periods that have, in themselves, no significance. As part of future research, it may also be possible to pursue comparisons between Reece's graphs of coin loss (1995, Figures 1 -29), and the patterns of consumption identified in this thesis.

A number of references have already been made to "significant" changes in demand over time. On the basis of data collected it is now possible to quantify, within the study area, the extent of these variations, and they are indeed significant. For example, at the beginning of the 2nd century, the estimated consumption of wine was some 10,000,000 litres but a hundred years later it had fallen to 3,300,000 litres. Similarly, olive oil had fallen from 600,000 to 200,000 litres, grain from 11,000,000 to 2,200,000 kilograms.

The graphs in Figures 11.1 - 3, show trends in consumption of grain, wine and olive oil, over the whole Romano-British period. As has been previously stated, these are the major bulk commodities affecting the volume of shipping, and most other items, such as pottery, are assumed to have been "piggy-backed" onto these cargoes. Clearly, the dominant factor is the decline in the military presence from a peak in the early 2nd century, but the graphs display sufficient peaks, valleys and plateaux to suggest that, as suggested above, variations in source of supply, taste and patterns of living also had a measurable effect.

Each graph is accompanied by only limited comment, as all relevant factors have already been discussed in this, and preceding chapters. Appendix 12 contains the data on which the graphs are based; Appendix 7 gives details of the events having significant effect on the raw data.

Grain

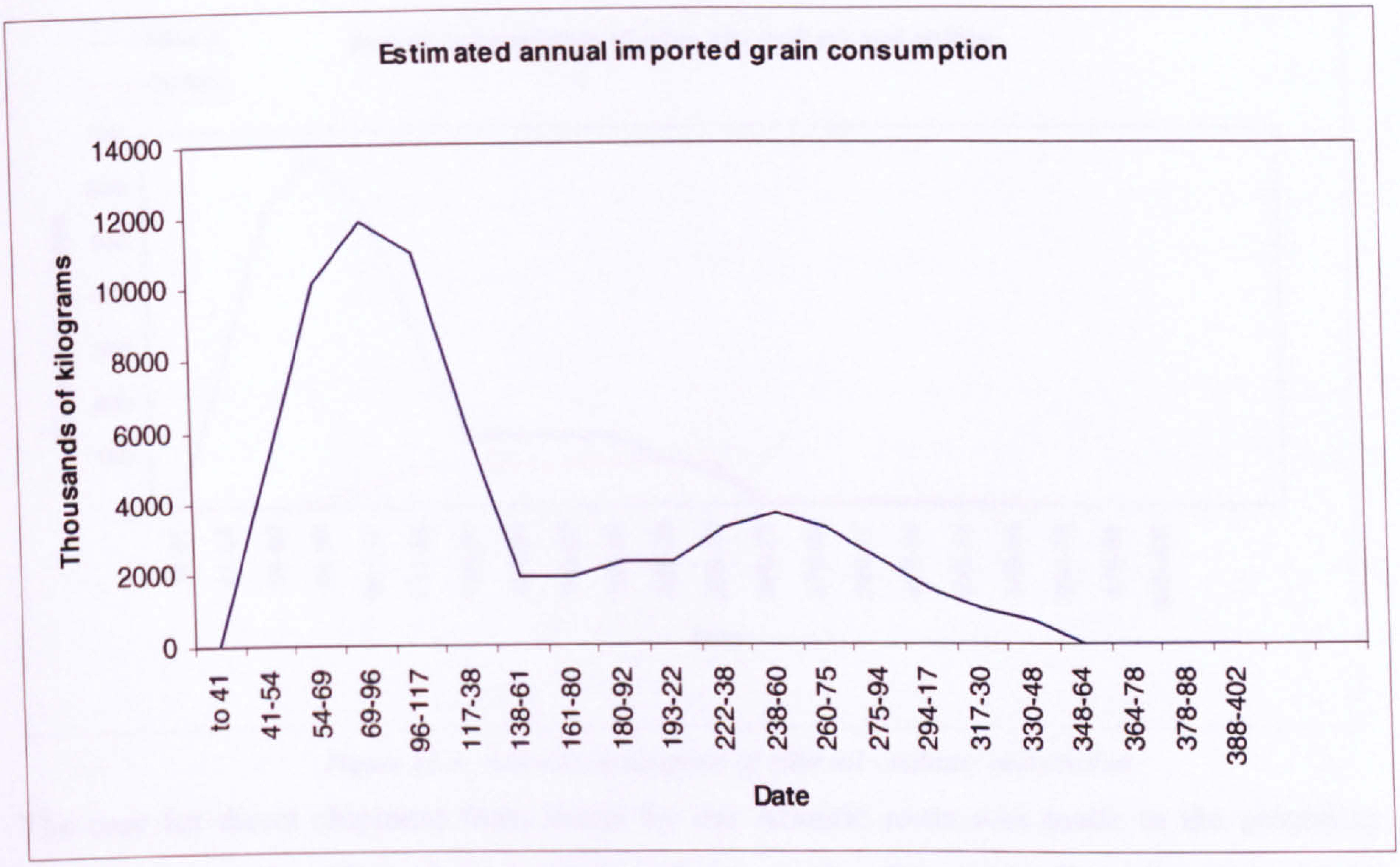


Figure 11.1. Estimated annual demand for grain "imported" to the study area.

It is possible that, as Manning (1975, 112-6) suggests, local grain production could have eventually been developed to meet military demand. However, it has been here assumed that the ready availability of high-quality from nearby sources, e.g. the Severn Valley and Cotswolds, and the ease of transport by water, would have made this the preferred option. Not only the cost-effectiveness of water transport was important, but it might be suggested that the Agricolan directive on grain supplies (*Tac.Ag.* 22. 2-3) might also have had a bearing on the military mind, as the responsibility was then shifted from the military commander to the Procurator!

The supply of grain to the inhabitants of the *canabae* and *vici* was probably, at some times, a military responsibility, and it is likely that this was the case in the period of conquest and early consolidation (c. AD 50-100). However, from the early 1st century, the local agricultural base was probably capable of supplying the majority of the needs of the military dependents.

A Roman army on campaign was supported by a transport train, comprising a large number of pack animals. These consumed significant quantities of barley or oats, which needed to be imported into the area of operations. As the period of offensive military operations in the study area was less than twenty years, it has been decided to deal with this below, as a separate topic.

Olive oil

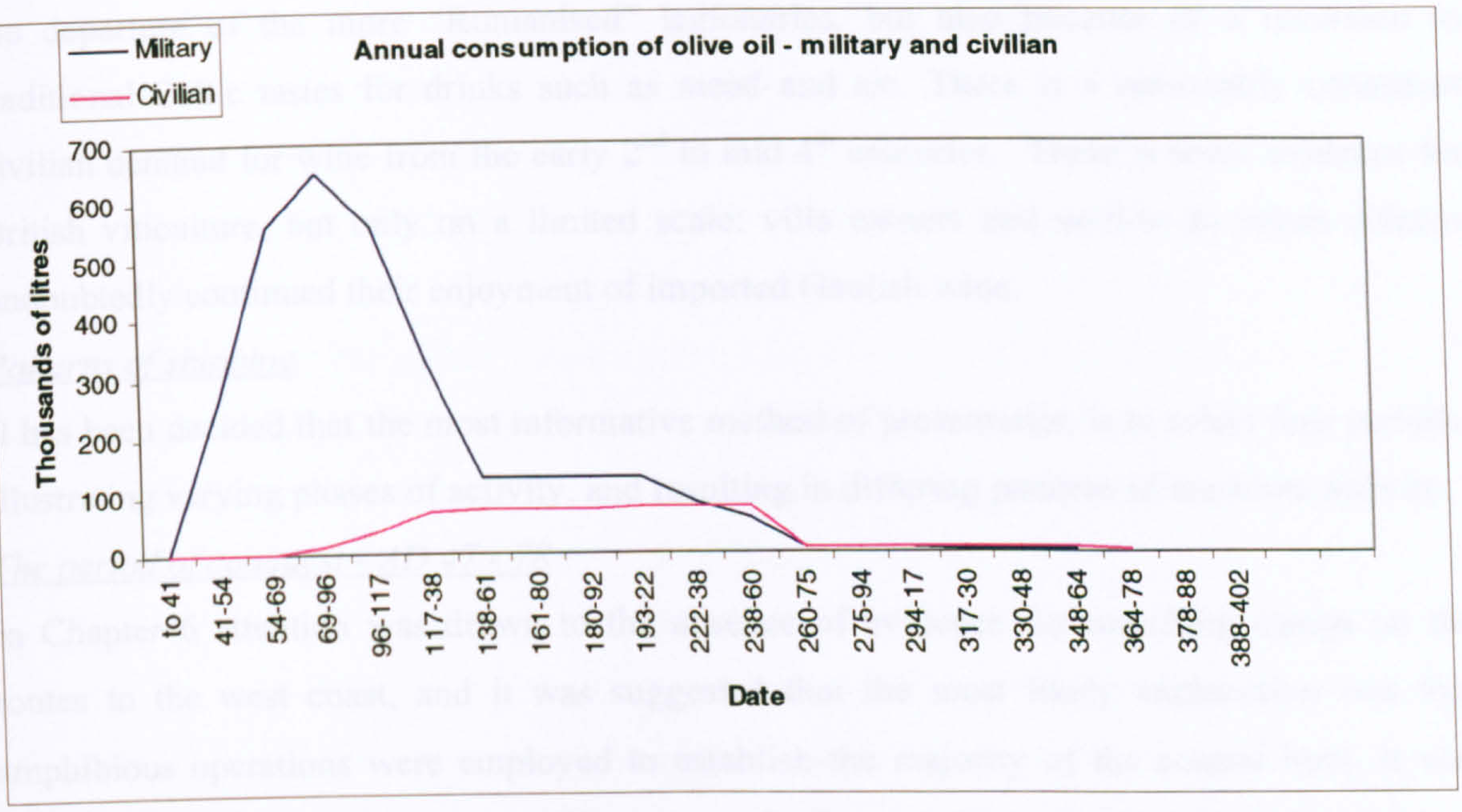


Figure 11.2. Annual consumption of olive oil - military and civilian.

The case for direct shipment from Iberia by the Atlantic route was made in the preceding chapter, as was the effect of the cessation of the supply of Spanish olive oil in the mid 3rd century. There is then evidence for some importation of African olive oil, but it is probable that the use of this was confined to the most affluent sectors of the population, and that the bulk of the population, both military and civilian, reverted to the use of animal fats for cooking, lighting and hygene.

Wine

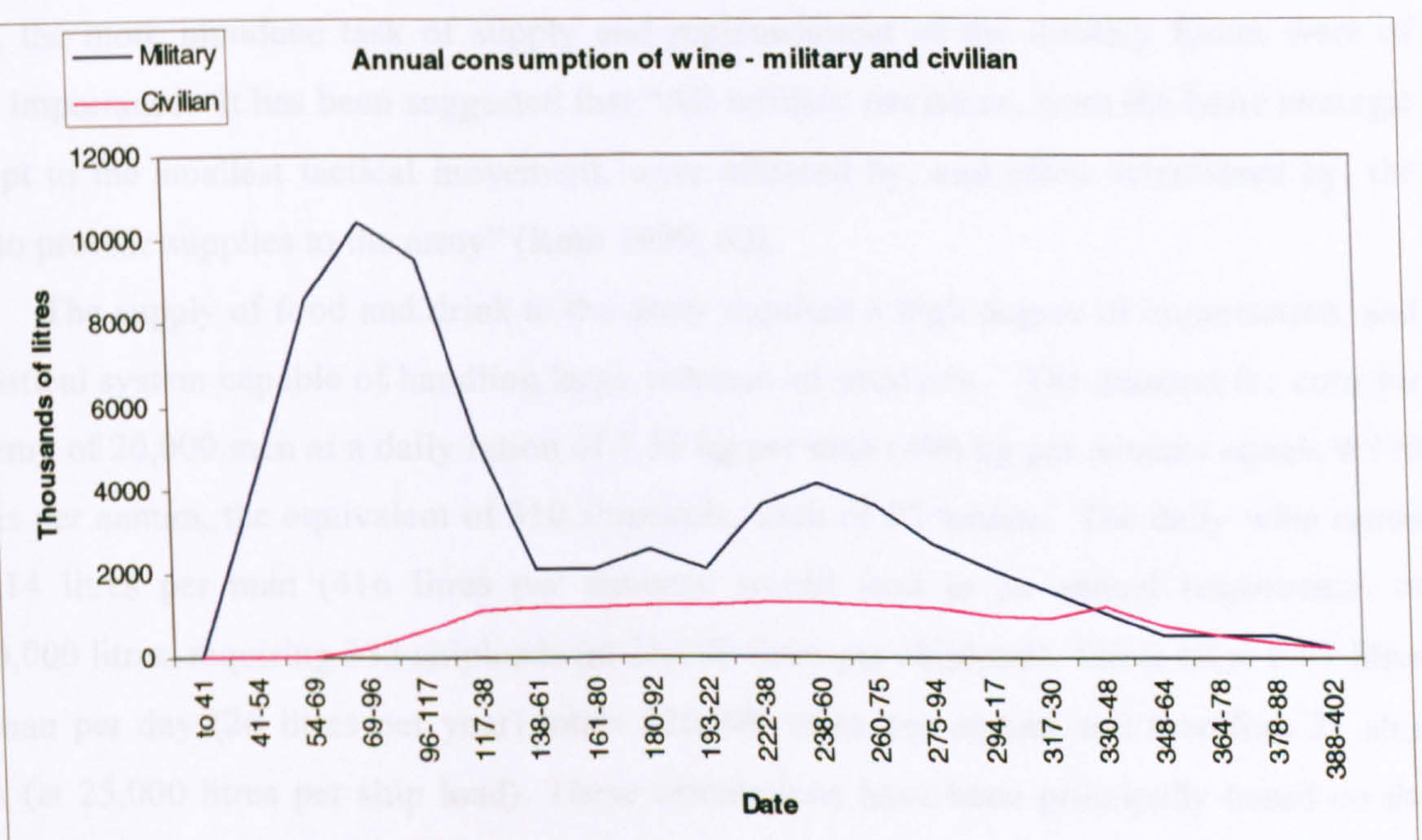


Figure 11.3. Annual consumption of wine - military and civilian.

The steady decline in military consumption from the mid 3rd century is not only the result of the departure of the more "Romanised" legionaries, but also because of a reversion to traditional Celtic tastes for drinks such as mead and ale. There is a reasonably consistent civilian demand for wine from the early 2nd to mid 4th centuries. There is some evidence for British viticulture, but only on a limited scale: villa owners and well-to-do urban citizens undoubtedly continued their enjoyment of imported Gaulish wine.

Patterns of shipping

It has been decided that the most informative method of presentation is to select four periods, illustrating varying phases of activity, and resulting in differing patterns of maritime activity.

The period of conquest - AD 47 - 78

In Chapter 6 attention was drawn to the absence of evidence for marching camps on the routes to the west coast, and it was suggested that the most likely explanation was that amphibious operations were employed to establish the majority of the coastal forts. It was considered that a task force comprising, say, a legionary cohort, an *ala* of cavalry and two cohorts of auxiliary infantry, would provide a more than adequate force to establish a beach head, construct a marching camp, and secure the surrounding countryside. Such a task force, comprising 2000 soldiers and 500 horses, would require some 30 troop transports and 35 horse transports. On the arrival of supporting supply vessels, a permanent fort, of conventional 1st century type, could be rapidly constructed and contact established with the main forces advancing from the east.

This is an example of the more "glamorous" aspects of maritime activity but, without doubt, the more mundane task of supply and replenishment of the military forces were of prime importance. It has been suggested that "All military decisions, from the basic strategic concept to the smallest tactical movement, were affected by, and often determined by, the need to provide supplies to the army" (Roth 1999, 62).

The supply of food and drink to the army required a high degree of organisation, and a logistical system capable of handling large volumes of products. The demand for corn for the army of 20,000 men at a daily ration of 1.36 kg per man (496 kg per annum) equals 9,920 tonnes per annum, the equivalent of 310 shiploads, each of 32 tonnes. The daily wine ration of 1.14 litres per man (416 litres per annum), would lead to an annual requirement of 8,320,000 litres, requiring 333 shiploads (at 25,000 litres per shipload). Olive oil at 0.07 litres per man per day (26 litres per year) totals 520,000 litres per annum and therefore 21 ship loads (at 25,000 litres per ship load). These calculations have been principally based on the work on the Roman military diet by R.W. Davies (1971, 1978, 1989), in turn based on the *Codex Theodosianus* 7.4.6 and an Egyptian papyrus of the 6th century AD.

The transport requirements of grain for the army's animals, are often over-looked, but are of considerable significance, being equivalent to 60% of that required for the soldiers.

Campaigning in the difficult terrain of the study area presented operational problems for the military supply trains, not the least of which was the need to provide hard fodder (barley and oats) for its own pack animals. A legion was supported by some 1400 pack animals (usually mules), each consuming approximately 2 kg of fodder per day (Roth 1999, 65-67), a total annual consumption of 1,022,000 kg. An infantry regiment had a supply train of 160 animals (total annual consumption 116,800 kg) and a cavalry *ala*, in addition to its horses, had some 275 pack animals (total annual consumption 200,750 kg). The total annual hard fodder requirement for the campaigning army of two legions, sixteen infantry and four cavalry regiments therefore becomes;-

$$2 \times 1{,}022{,}000 = 2{,}044{,}000 \text{ kg}$$
$$16 \times 116{,}800 = 1{,}868{,}000$$
$$4 \times 200{,}750 = 803{,}000$$

giving a total annual consumption of 4,715,000 kg.

Horses also consumed c.2 kg of fodder per day (Tomlin 1999. 31-84), a cavalry regiment had, including remounts, 550 war horses (total annual consumption 401,000 kg)), each legion had 170 horses, used by staff officers and messengers (total annual consumption 127,750 kg). The total annual hard fodder requirement for the two legions and the four cavalry regiments is therefore:-

$$2 \times 127{,}750 = 255{,}500 \text{ kg}$$
$$4 \times 401{,}000 = 1{,}604{,}000$$

giving a total annual consumption of 1,859,500 kg.

The total demand for hard fodder for the campaigning army is therefore 6,574,500 kg, i.e. 6,575 tonnes. Using "average" 60 ton transport ships, each with a cargo-carrying capacity of 32 tonnes (see Chapter 8 and Appendix 10) results in a need for the importation of an additional 205 shiploads per annum.

The total annual number of shiploads is therefore;-

From within the Province		
Grain for the soldiers	310	
Grain for army dependents	50	
Fodder for the animals	205	565 shiploads
From the Continent		
Wine	333	
Olive oil	21	354 shiploads

By coincidence, this is approximately the number of shiploads required to transport the invasion force of AD 41, and while the areas of operation, required time frames and nature of the tasks are very different, the comparison serves to illustrate the continuing high level dependence on water transport. Clearly, these are maximum values and do not take account of reductions for vexillations operating outside the study area. However, they do indicate the magnitude of the task of importing supplies to the study area (whether, grain from sources within the Province, or wine and olive oil from Iberia and Gaul).

Movement to the forward areas

So far, only the bulk import of supplies has been considered; clearly there was a similar requirement for redistribution of the supplies to the forts and marching camps of the area. In some cases, direct shipment by sea-going vessel to the destination is possible – for example the coastal and estuarine forts at Cardiff, Neath and Caerhun, and to those on a major navigable river (e.g. Monmouth on the River Wye, or Droitwich on the River Severn). In other cases transhipment to river barges was needed to reach forts near to the limit of river navigation, such as Clyro on the River Wye, Abergavenny on the Usk or Caersws on the upper reaches of the Severn. In other cases, grain was available from nearby areas, such as the Cotswolds, Severn Valley and Cheshire Plain, and could be loaded close to source for direct onward transport. Figure 9.8 has shown all sites considered navigable, and supporting data is contained in Appendix 1. Of 65 sites in the area (not all occupied at the same time), 50 are considered capable of direct supply by water transport, 15 would need supply by land transport. The impact of a 70% provision for supply by water would have a considerable effect on the demand on the supply train, and might result in a significant reduction in size, with the consequent effect of a reduction in the demand for hard fodder, and a "knock-on" reduction in the volume of shipping required.

Consolidation - AD 96-117

With the army established in a "peace-time" garrisoning role, but as yet not reduced in size, the demand for supplies and provisions for the soldiers would be similar to that previously described, but the need for animals for a supply train would be significantly reduced, say by 75%. There were now thriving *canabae* and *vici* adjacent to all forts, cities at Gloucester, Wroxeter, Carmarthen and Caerwent and prosperous small towns such as Cowbridge, Kenchester and Worcester. These would have been self sufficient in grain, and the decrease in the demand for fodder for the supply train would result in a reduction of perhaps 150 shiploads of imported grain. The shipments required to meet the military demand for olive oil and wine would remain at a similar level to the previous period, but with 50% of the army, i.e. the 20th and 2nd Legions now permanently established at the tidal ports at Chester and Caerleon, the need for transhipment would be much reduced. There was a demand for olive oil and wine for consumption by the civilian population (*Figures* 11.1 - 2), perhaps 50,000 litres of olive oil and 600,000 litres of wine per annum resulting in some 25 shiploads in total.

This was the period when the forts and fortresses were re-built in stone, and was also the time of much construction of public buildings, private dwellings and business premises in the cities and towns. The ready local availability of building stone, obviating the need for major importation, has already been previously mentioned as, however, has the desire for high-quality architectural stone such as Cheshire sandstone from the north, and Cotswold or Bath limestone in the south and, although impossible to quantify, a steady movement of cargoes from these areas is predictable. Even a so-called stone fort or fortress had many buildings partly constructed in timber; Mason (2001.47) has estimated that 31,000 tonnes were used in the construction of the fortress at Chester. At a yield of 40 tonnes per acre this would require the felling of 778 acres of woodland, and the most obvious source to be exploited would be from up-river. From this point, the timber could be either loaded onto barges or made into large rafts, taking advantage of the downstream current.

Much of the movement of ironwork needed for construction of the cities and forts was probably undertaken by small craft similar to the Barland's Farm Boat. Iron production at The Chesters, near Woolaston (Fulford & Allen 1992, 159-215), was in the order of 1.8 tonnes of finished blooms per annum, and this was one of the larger sites on the Severn Estuary. One can imagine the boat leaving Magor Pill, near Newport, calling at one or two smaller sites, and then loading blooms at Grange Pill, near The Chesters, to complete its cargo. There it would wait for the incoming tide and reach the iron-smithing town at Worcester on a single spring tide. A return cargo of finished iron products goods, or perhaps Severn Vale pottery, would result in a profitable voyage lasting perhaps a week or ten days.

The over-all impression is that the volume of shipping in sea-going vessels was similar to that of the previous period, but that, because of the growth of civilian commerce within the area, associated with the development of towns and cities, the volume of shipping in coastal craft and barges was considerably increased.

The Gallic Empire, Carausius and Allectus - AD 260-296

During this period Britain was successively part of the Gallic Empire (AD 260-74), recovered for the Empire, broke away again under the usurpers Carausius (AD 287-93) and Allectus AD 293-6) and then retaken by Constantine I (*Figure* 3.15). However, by comparison with the other Northern Provinces, the area was an oasis of calm, with no serious barbarian incursions, and no evidence of civil unrest such as the revolts of the *Bacaudae* in Gaul. The political separation from the main Roman Empire had economic consequences but, in terms of trade and commerce, these were relatively insignificant. By this time Britain had a fully developed independent economy, with a strong manufacturing base, for example, there was now a thriving indigenous pottery industry, and the importation of continental pottery had been greatly reduced. Olive oil was no longer available from Spain in any quantity, but wine, now imported from Gaul in barrels, continued to be imported, albeit in much reduced quantity. These changes had a dramatic effect on the volume of overseas shipping in the study area. In the case of olive oil, the estimated volume imported in the periods previously described (the late 1st/early 2nd centuries) was some 600,000 litres (24 shiploads), for wine the figure was in the order of 9,000,000 litres (360 shiploads). By the current period (late 3rd century) perhaps only the 20,000 litres (the equivalent of one shipload) and 4,000,000 litres of wine (160 shiploads) reached the study area.

By this time; the garrisons of Caerleon and Chester were much reduced, and only seven forts remained occupied, therefore the military demand (including fodder) for grain had fallen from over 14,000,000 kg (565 shiploads) during the mid-late 1st century to some 2,000,000 (80 shiploads). Even this decreased quantity may not have been shipped into the study area, as the demands of the *annona* may have resulted in local supply and delivery.

It is therefore likely that the volume of shipping, on the seas and estuaries, was reduced from the 1st /2nd century peak of over 900 shiploads to less than 200 by the end of the 3rd century.

Decline and fall – AD 350-410

Millett (1990, 212) has commented that "During the third quarter of the fourth century Britain was utterly Roman. Legally and culturally there was little to distinguish her inhabitants from any other province, except for some Celtic rather than Hellenistic or Italic undertones". This may well be true, but there were some significant economic differences, as the English Channel had ensured that Britain had remained insulated from the major effects of the barbarian invasions of the Northern Province. However, in terms of trade, this insulation led to a form of isolation. There is some evidence of shipment of British grain to the Rhine at this time (Ammianus Marcellinus 18. 2,3; Libanus 18, 82-3) and there may well have been some return cargoes, for example wine, but these imports were largely confined to the south east, having little impact on the study area. Whilst the effects of barbarian attacks in AD 367 have perhaps been exaggerated, they caused widespread disruption and a loss of confidence, and the effect on trade and commerce cannot be overestimated. Whilst there was still considerable use of the inland waterways (for example, Wroxeter remained a prosperous settlement until the latter part of the 5th century), it is difficult to envisage any significant volume of sea-going trade, perhaps falling to a level even less than that before the Roman invasion.

Volume of shipping

There has been considerable discussion on the role of civilian suppliers in supplying the army (e.g. Breeze 2000, 59-64) but whatever the mechanism, it is highly probable that, in Britain, the Procurator was responsible for this task, and had the necessary authority to direct the suppliers to operate in the most effective manner. For the purposes of the following discussion it will be assumed that this included direct delivery to the point of consumption, wherever this was a practical proposition, thus minimising the volume of transhipment and cargo handling.

Both the Theodosian Code (13.9.3) and Vegetius (*Mil.* 4. 39) describe a sailing season of seven months from April until the end of October. This was primarily intended to apply to the Mediterranean, but it does give a general indication for the volume of voyages in the study area. At the period of the greatest volume of traffic, the late 1st/early 2nd centuries, this suggests a monthly average of 80 consignments of grain, 47 of wine and 3 of olive oil. However, the shipment of each of these commodities poses different problems, require different solutions, and a monthly average is somewhat mis-leading.

<u>Grain</u>

Obviously, grain is not available for shipping until the harvest has been gathered in (traditionally by Lammas Day, 1st August), with a consequent reduction in the possible shipping period. However, it would be possible to minimise the effect by completing shipments to tidal coastal locations in the late summer/early autumn months, leaving consignments to the destinations on the Severn and Wye till the late autumn, or even early winter. In this way, the hazards of out-of-season voyages would be avoided and, equally importantly, river levels would be high enough to permit navigation to the upper reaches. For example, in the early Flavian (c. AD 74-80) period (*Figure* 10.2), the west coast forts at Tomen-y-mur, Brithdir, Pennal, Pen Llwn, Trawscoed might be supplied first, the north coast forts at Prestatyn, Caerhun and Caernarfon and the south coast forts at Carmarthen, Loughor, Neath and Cardiff next, then the legionary fortresses at Chester and Caerleon. The requirement for grain for an auxiliary fort was some 250 tonnes (8 shiploads) and for each legionary fortress 2500 tonnes (80 ship loads), giving a total of approximately 240 out of the total of 565 consignments. Over the three month period from August to the end of October, and assuming two voyages per vessel per month, this would give a requirement for 40 vessels of the Blackfriars 1 type. Unlike later periods, there would be no need to wait for availability of cargo or return loads, and the number of voyages might well be increased. If 50% of the remaining grain consignments were loaded onto barges, near to the source of supply, and delivered direct to the destination, there would be a remainder of 160 consignments. This could be met by 10 vessels operating in a similar manner to the Severn trows of later periods, plus the redeployment, from the beginning of November, of the 40 ships previously used for coastal supply.

<u>Olive oil</u>

Assuming an average distance covered of 70 nautical miles per day, the 1500 mile passages to and from Southern Spain would take approximately 40 days. Although there are 210 days in the sailing season, it is improbable that more than three round trips, and possibly only two, would be made, and that perhaps 10 vessels would be involved. As a single fort would only require half a shipload (13,000 litres) per annum, it is likely that cargoes from Iberia would be shipped to ports, such as Chester, Caerleon or Gloucester, and the oil re-distributed to the forts, as part of a mixed cargo. It has been mentioned above that decorated hemispherical cups and ovoid beakers, manufactured in the valley of Guadalquivir, have been found in Britain (Greene 1979, 63-73), probably piggy-backed on olive oil shipments. Unfortunately, to the writer's knowledge, there is no evidence for return cargo to Iberia, although it is probable that this occurred.

<u>*Wine*</u>

Peacock's map of shipment routes to Britain (*Figure* 9.1), based on Strabo's 1st century AD writings (N.H. 4.5, 2), includes continental departure points from the mouths of the Rivers Loire and Garonne. Peacock's routes show entry to the English Channel, but the same arguments that have previously been advanced for direct shipment of olive oil via the Bristol Channel and Irish Sea (*Figure* 9.3) hold good for wine. For example, this was certainly the case in the Middle Ages when, from these areas, Bristol handled 24% of England's imported wine (Horton 1997, 12-13).

As the annual ration for the soldiers of an auxiliary fort was some 9 shiploads, direct shipment as suggested for the supply of grain would have had many advantages. However, in this case, the full seven months of "seasonal" sailing were available, and the total study area requirement of 333 shiploads, assuming only one voyage per vessel per month, would require the employment of some 48 vessels, importing wine to Britain. It is, however, possible that the 40 vessels needed to transport grain from the beginning of August might have been used, to tranship wine from the Bristol Channel to the northern area, probably to the port at Chester on the River Dee, or to other forts such as Caernarfon or Caerhun.

<u>*Conclusion*</u>

It has to be accepted that many of the suggestions put forward in this chapter may be erroneous as, in some cases, they are based on interpretation, rather than fact. For example, the ration scales on a 6th century Egyptian papyrus may not have been applicable to soldiers in Roman Britain at an earlier period. Demand has been based on the estimates of population and it is well known that assessment of size of population, in the absence of documentary evidence, is fraught with difficulty. Therefore, some of the data used in calculation of consumption estimates may be flawed. With this *caveat*, the estimates do at least open a window on a topic that, on this scale, has hitherto been neglected.

Chapter 12. Conclusion

Introduction

This thesis has examined the ships and boats of the period, the supply and provisioning of the army, Roman sea power, and naval and military operations in Western Britain. The development of ports and river systems, the types of cargoes and cargo-carrying capacities, and the use of waterways and roads have also been discussed. Numbers for the various population sectors have been derived and these, combined with the estimates of demand and consumption, have provided sufficient information to quantify the volume and directions of shipping in the study area.

The course of some parts of this thesis has ventured into previously uncharted waters, and has therefore been subject to the inherent dangers of this form of action. Metaphorical reefs, sandbanks, adverse tides and difficult weather conditions have been encountered. Nevertheless, it is arguable that, by arriving at a reasoned assessment of the role and extent of water transport in the study area, the voyage has been successfully accomplished.

One of the major hazards has been the quality of the available evidence, for whilst the story of Roman Britain is well endowed with later historical accounts and archaeological interpretations, it is somewhat less well provided with reliable original sources. For example, our only source of significant information on early Roman Britain is the historian Cornelius Tacitus (AD 56/7-after 112), whose major work was a history of Rome in the 1st century AD. Extracts from his work that can reasonably be related to events in the study area have been extracted from translations of the original works, and these amount to less than 1600 words of text (Appendix 2). In view of this paucity of reliable historical sources, it is perhaps not surprising that Millett (1990, xvi) observed that, whilst working on *The Romanisation of Britain*, he had "become intensely aware that some established opinions about the subject are based not on evidence, but on what have been called factoids. These are pieces of information which have been so commonly repeated that they are almost indistinguishable from facts".

Even when reliance is placed on published archaeological investigation, there has been a tendency to present dates and events with a level of precision that may not be wholly justified. For example, many Roman villas, towns and forts throughout Britain have been partially excavated, but in many cases, this took place at a time when archaeologists considered it sufficient to excavate down to only the uppermost Roman levels, therefore making it impossible to determine the complex histories of many of the sites. The situation has, to some extent, been mitigated by recent excavations that reveal periods of abandonment and re-occupation, changes in garrison and construction. For example, the history of the fort at Neath (*Nidum*), where initial construction and occupation dated from AD 80/90 is complicated. Some rebuilding took place, and the site was occupied until c. AD 110/115.

This was followed by a short period of abandonment and then reoccupation from about AD 117 to 125. The fort was again abandoned from about AD 125 to 140, with a second re-occupation lasting from AD 140 to 170. There is evidence for partial re-occupation from AD 275 to 320 (Marvell & Heywood 1992, 179).

Attempts to determine the course of various campaigns using the archaeology of forts, tied in with the historical sources have been made (e.g. Webster 1970; 1980), but if the basic datas are subjected to critical scrutiny, the quality of the evidence suggests that they are not sustainable, other than in the most general terms. Millett (1990, 18) warned against attempting to force archaeological evidence into a "straitjacket of rather limited literary sources". This finds an echo in Hurst's comment that, when considering the generally accepted chronology for the Roman campaigns in Wales, he was "obliged to express scepticism about the whole principle of attempting to reconstruct military history to this level of detail" (1986, 18). Nevertheless, in the context of this thesis, it is the overall pattern that is important - not the precise dating of a specific event.

The most challenging obstacle has been that, as Fulford (1978, 62) points out "A healthy trade in perishables and raw materials could well have been carried on without leaving any trace in the archaeological record". As an assessment of the transport of corn, wine and olive oil is a major element in this thesis, this absence of archaeological evidence, and the paucity of contemporary documentation, means that it has been necessary to assemble data from diverse sources, such as a 6^{th} century Byzantine wreck from of the Turkish coast, and from the 17^{th} century Port Books of Bristol.

<u>*Changes in the coastal and riverine landscape*</u>

The present-day landscape shows evidence for change, these have not been as significant as those in other parts of Britain (e.g. Reculver/Richborough, *Figure* 2.1; London, *Figure* 2.3), and are not sufficient to mask the features of the maritime landscape of the Roman period. In certain cases the changes have taken place in recent times, for example, the loss to the sea of part of the fortlet at Martinhoe (*Figure* 6.4*)*. However, there is archaeological evidence in the study area for change, and response, during the Romano-British period. Because of alterations in the course of the River Severn at Gloucester, there were two successive waterfronts (*Figure* 7.4), over 100m apart (Hurst 1999, 123). The timber extension to the quay (now some 230 m from the present course of the River Usk) at Caerleon (*Figures* 2.4; 7.3), was probably needed to maintain a sufficient depth of water in front of the quay as silt was deposited and, as the river, in consequence, began to shift its course to the south-west (Boon 1978, 8).

However, several places that flourished as ports during the Romano-British period have now no maritime function, but it is unwise to attribute this to geomorphological change alone, even if this has taken place. For example, in Roman times, seagoing ships on passage to Chester could take advantage of the incoming tide, sail up the wide estuary of the River Dee and unload their cargoes at the quays of the fortress of *Deva*. Silting of the estuary was recorded in the Middle Ages, and navigation up to Chester became increasingly difficult. In an attempt to solve the problem, the New Cut was dug in 1735-6 giving a depth of 16 feet of water at moderate spring tides enabling access for ships up to 200 tons (Ward 1996, 4-10). However, the only vessels now to be seen in the area of the once prosperous Roman port are small pleasure craft. By contrast, at Caerleon, also the site of a major Roman port, there is no evidence for any significant man-made interference with the natural course of the Usk. The greater volume of freshwater passing downstream, combined with the scouring potential of Bristol Channel tides, means that, unlike the Dee, the river maintains its earlier navigability. However, like Chester, only a few small fishing boats now lie in the river, with all sea-going vessels being handled on the coast at Newport.

The real reason for the demise of estuarine ports is perhaps not the result of natural processes. There is no insurmountable reason why, at the present time, a vessel similar to the St Peter Port ship of the Romano-British period should not navigate to either Chester or Caerleon. Perhaps the reason is that it is the size of the vessel that determines access to a port, and it is not questions of siltation, the reduction in coastal traffic and the like, that have fundamentally affected Chester or Caerleon, but simply that ships have become larger.

Merchant ships, coastal vessels, boats and local craft of the period

The wide range of vessels and craft of the period is demonstrated by the excavated remains of two sea-going ships; two estuary and coastal craft; a river and estuary barge and several log and plank boats. In addition, hide boats, similar to the later curragh and coracle were widely used and, although not surviving in the archaeological record, and many details are inferred in the writings of Caesar (*BCiv.* 1.54), Pliny(*HN* 4, 104) and Lucan (4, 136-8). Sufficient information is therefore available to indicate performance and load-carrying capacities; this has been later used to calculate the probable volume of shipping in the study area.

Considerable emphasis has been placed on the tidal conditions experienced in the Bristol Channel, St George's Channel and the Irish Sea (Appendix 11), for example a tidal rise and fall of over 13 m, exceeded only in the Bay of Fundy, off Newfoundland. It has been stressed that it is the ability to "work the tides" that is the determining factor in passage planning. The example has been quoted of a passage from Bristol to Gloucester taking only some 12 hours, but the return journey taking several days. Wind direction was of equal importance, as the prevailing southwesterlies mean that a down Channel voyage was difficult because of the inability of square-rigged, single-masted craft to make significant progress to windward. The effect of a prevailing wind was not restricted to the seas around Britain as, for example, the outward voyage of the Roman grain fleet from Puteoli to Alexandria, a distance of some 1000 nautical miles, took nine days, but in the summer season, against the dominant northwesterlies, the return voyage lasted one to two months (Casson 1971, 297-9).

Supply and provisioning of the Roman army

The supply and replenishment of an army on campaign is mainly a problem of logistics and a matter of short-term policy, but for an army in garrison, it becomes dependent on the carrying capacity, and economic stability, of the area on which the food supply is based. The major campaigns in the Southwest Peninsula lasted only from AD 43 to 47 and the garrisons were concentrated on the centre and south coast of Devon and Cornwall. By contrast, the conquest of Wales fell into two distinct periods; from AD 47 - 60 and from AD 71 – 78. However, the situation in Wales from AD 60 – 71 was that of any army occupying hostile territory and the problem of supply to the military was little different to that required for an army on campaign.

When on campaign the Roman army took a large quantity of equipment and supplies into the field. In addition to the individual soldiers' personal weapons and equipment, this included artillery, missiles, portable fortifications, tents, medical supplies, cooking gear and much more. However, approximately 90% of the weight of supplies needed by the Roman army was made up by the requirements of food for the soldiers, fodder for the animals and firewood for cooking. Roth (1998, 2) goes so far as to suggest that "all military decisions from the basic strategic concept to the smallest tactical movement were affected by, and often determined by, the need to provide these supplies to the army".

In contrast to other ancient armies the Romans issued regular rations, with the cost of the supplies being deducted from the soldiers' pay, the normal rations for a soldier comprising bread, meat (either fresh veal or pork or salt pork), wine and oil. The basic grain ration was supplemented by meat, vegetables (especially legumes), cheese, oil, vinegar, salt and wine, indicating that the Roman soldier enjoyed a rich and varied diet (See Appendix 6 for food at Vindolanda). However, many of these commodities would not have been available whilst serving in the field; others such as meat would have followed the army "on the hoof". Whether stationed in winter quarters, in times of peace, or later in permanent barracks, many of these items would have formed part of bulk consignments of wheat, or loads of amphoras containing wine or olive oil. These minor products would not have created a significant addition to the volume of transport required, forming only a small part of the major consignment.

Roman sea-power and the Classis Britannica

Milne (1996, 235) considered that a "mundane supply role almost certainly formed the greater part of the duties of the British fleet, a merchant marine rather than a fighting force", and that "The zone within which the *Classis Britannica* operated included all of the British Isles which were under Roman rule". The first assertion is acceptable, but the second is more open to question. As evidence Milne cites, *inter alia*, inscriptions from Hadrian's Wall which testify that *Classis* personnel were involved in its construction. But so were legionaries, auxiliaries, and even the citizens of Ilchester (RIB 1672/3)! This surely does not demonstrate that the *Classis* was involved in the north in an operational sea-going role, whether naval or merchant. Detached flotillas, operating under command of the army, is the more realistic scenario.

Fulford (1996, 17-19) has argued that the British fleet supplied the army on the eastern and the southern shores of Britain, and that *legio II Augusta* undertook the same duties on the west coast. However, Breeze (2000, 62) comments that "there is no direct evidence known to me for the use of the British fleet in supplying the army of Britain in peacetime". The writer's opinion is that whilst active military operations were in progress, units of the fleet may have acted in a similar manner to that of the present Royal Fleet Auxiliary, i.e. transporting troops and supplies. However, by the early 2nd century, the study area had been conquered, there was therefore no need for naval involvement and the use of merchant shipping appears the most effective solution.

No archaeological evidence for a Roman navy ship has been found in Britain, but written and epigraphic evidence suggests that the most commonly used vessel was the *liburnian* (*Figure* 5.5), a single-masted vessel, with a square sail and two banks of oars. The sea-worthiness of this craft is indicated by Tacitus who records how, in AD 83, three *liburnae* were hijacked by a cohort of Usipi, possibly in the Firth of Clyde; sailed north round Scotland and along the East Coast, crossed the North Sea and eventually reached the territory of the Frisii on the coast of Holland (*Ag.* 28).

Naval/military operations in the west of Britain

The naval operations of the 1st century AD, with large numbers of ships being deployed in support of a full-scale invasion, were very different to those of the 3rd and 4th centuries, when isolated detachments of naval vessels, based at the few remaining coastal forts, faced a losing battle in attempting to protect a long and vulnerable coastline against raiders from across the Irish Sea (*Stil.* 2. 251).

In addition to an assessment of naval operations in the supply role, research for this section has suggested that, because of the apparent absence of marching camps near to the coast, "combined operations" involving amphibious landings of joint legionary/auxiliary forces, in brigade strength, were used to secure beachheads on the Welsh coasts. By then advancing along tidal river valleys such as the rivers Ystwyth, Dwryd and Dyfi, using sea transport for supply and replenishment, forts could be established at Trawscoed, Tomen-y-Mur and Pennal respectively (*Figure* 6.10). The suggestion of Roman sea-based offensive operations in the study area is new, but is perhaps supported by the late 13th century Welsh wars of Edward I. These involved land invasions of North Wales, supported by ships carrying supplies for the army, and were also used to occupy the island of Anglesey (Friel 2003, 53).

There may have been an extended line of fortlets running along the coasts of the Bristol Channel (*Figure* 6.7). It is suggested that the fortlets at Old Burrow and Martinhoe were not signal stations, as Fox and Ravenhill proposed, intended to warn of Silurian naval action (1965, 253-8). Together with Coed-y-caerau, St Genny's, Steep Holm (*Figure* 6.5), and others yet to be identified, they more probably formed part of a chain of headland warning beacons, with nearby safe haven protection.

Development of rivers, ports and landing places

There is no doubt that the Romans were capable of constructing large scale port installations and improving and maintaining river navigation. By contrast with later periods, Roman law provided legally enforceable constraints protecting the rights of navigation, and this compares favourably with the situation facing the "improvers" of the 17th/18th centuries

The magnitude of the problem of cargo handling at Caerleon or Chester should not be under-estimated. In addition to the 80 consignments of grain (concentrated in the months from August to October), the requirement for wine for the fortress itself (90 shiploads), possible transhipment of olive oil, and the provisioning of military stores and equipment to the subsidiary forts, suggests at least one arrival and departure of a major vessel each day of the sailing season. This indicates a need for more extensive port facilities than have, so far, been discovered. Boon (1978, 4) thought that large scale work to the south-east of the excavated quay "would probably reveal the whole layout of the wharves and storehouses, upon which our excavations have only impinged"

The potential for inland water transport is demonstrated by later trade on the River Severn. From the early Medieval period the river was, once again, a major trade route for traffic to and from the West Midlands and the Welsh Marches. In favourable conditions, the Severn was navigable for 250 km. Pool Quay, near Welshpool, became an important waterway settlement, remaining in active use until the early 19th century. For example, in 1756 there were 376 vessels owned by traders living between Welshpool and Gloucester, and in the 18th century, some 4,000 watermen and their families worked on the Severn. The most common vessel was the Severn trow of some 50 tons, with fore and aft sails, and therefore a performance to windward superior to that of similar sized square-rigged vessels of the Roman period. However, in confined river waters, this would be of little advantage, as tacking was usually impracticable, and sailing was therefore only possible when the wind was abaft the beam. Teams of men known as bow-hauliers dragged the barges and trows, when the sails could not be used.

The fact that, during the Roman period, a river might have been naturally navigable, or might have been made navigable, does not necessarily indicate that it was in use as a major waterway. Clearly the cost-effectiveness of river improvement and maintenance were important factors. However, we should bear in mind the actions of Corbulo who, in a more useful way than soldiers of the British army in recent times who were employed in whitening stones and blacking coal, is said by Tacitus that "to keep his soldiers free from sloth (present writer's emphasis), he dug a canal of 23 miles in length between the Rhine and the Meuse" (*Ann.* 11.21).

Cargoes and cargo-carrying capacity

Britain was rich in minerals - Tacitus (*Ag.* 32) wrote of "gold, silver and other metals", Pliny the Elder described lead "in abundance" (NH 34, 17. 164), Diodorus Siculus spoke of large quantities of tin. In addition, the Province was rich in iron, coal, copper and salt, and all these commodities provided part-cargoes for water transport. Grain was produced in quantity (*Strab. Geography* 4. 5.2) and, on some occasions was exported to the Continent (*Amm. Marc.* 18. 2,3). However, it is suggested that certainly during the period of conquest and consolidation, and probably until the 4th century, it was normal practice for military installations to rely on grain brought in from the more fertile areas, such as the Cotswolds.

Although imports in pottery have received the greatest amount of attention, the volume of cargo was minute in comparison with that of wine or olive oil, and this thesis has made an attempt redress the balance. Fulford has suggested that the importation of pottery was only a minor trade "tacked on" to bulkier cargoes of perishables (1984, 129-42). Fortunately, wine and olive oil were transported in amphoras and although the perishables themselves have been consumed, amphora sherds survive in the archaeological record, so providing evidence of patterns and chronologies of distribution.

Using evidence from the wrecks of the St Peter Port Ship (Rule and Monaghan 1994), the Blackfriars 1 ship, the County Hall ship (Marsden 1994) and the Barland's Farm boat, it has been possible to arrive at profiles of some of the vessels operating in British waters. Combined with data on the amphora cargo from the Yassı Ada wreck (Bass and van Doorninck 1983), calculation of tonnage using several different formulae and the use of stowage factors, i.e. the quantity of cargo that may be loaded to fill a hold of known capacity (Appendix 10), an "average" merchant ship operating in British waters would have had a cargo carrying capability of c. 60 tons and a hold capacity of 33 cubic metres. Clearly a wide variety of vessels of various sizes and types plied the seas and rivers of Roman Britain, but the use of a "standard" capacity enables an estimate of the volume of shipping to be later calculated.

Waterways and roads

Movement by water would have provided a viable alternative to road transport, initially for military activity, and in the later 1st century for the establishment of urban communities. The needs of the cities, towns and remaining forts would have continued the requirement into the 2nd, 3rd, 4th and possibly 5th centuries. In addition to the transport of major cargoes of grain, wine and olive oil, the products of the extractive industries of quarrying, tin, copper and lead were particularly suited for movement by river. Severn Valley pottery could have been moved either up or down river, the iron blooms produced on the Severn Estuary sites were, because of the weight factor, ideally suited for movement up-river to Gloucester and beyond. A Roman sea-going merchant ship could carry a cargo of 60 tons, and if this would be transferred, say at Gloucester, into 5 x 10 ton barges to take its cargo up river. If the cargo were taken inland by road, 110 ox-wagons and between 500 and 1,000 oxen, or 440 mules would be needed, depending on the terrain. Some 25 men would have been needed to work the barges, compared to 220 men (drivers plus leaders) would have been required for the wagon train. Extra animals and wagons would be needed to carry the fodder for the animals pulling the cargo.

Inland transport in Roman Britain, whether by road or river, at least equalled, and in the majority of cases surpassed, that of the medieval period, and it is probable that it was not until the late 18^{th} century that the transport systems of the Roman period were bettered. The demand for an efficient system of inland water transport certainly existed. All cities and towns were on, or adjacent to, navigable waterways. The fortresses and ten of the forts were located on the coast, or on tidal estuaries with easy access to sea-going vessels. A further thirteen forts were sited on navigable rivers, and five more were sufficiently close to navigable waterways to benefit from them.

The cost advantages of water transport (Duncan-Jones 1974, 366-9) and the restrictions placed on loads carried on roads (e.g. *Codex Theodosianus,* 8.5.30); suggest that this form of transport would have been the preferred option. However, Finley (1973, 126) commented that, prior to the advent of railways, "Towns could not safely outgrow the food production of their own immediate hinterland, unless they had direct access to waterways". In some cases necessity, rather than cost-effectiveness or convenience, may have been a major factor in the choice of water transport.

This thesis has argued that concentration of research on imports to Britain via the continental rivers systems, has resulted in an underestimation of trade (particularly in olive oil and wine) via the Atlantic route. The bias in this direction is understandable, as artefacts and epigraphic evidence (e.g. Hassall 1978, 41-8) are found in much greater quantity on inland, as opposed to maritime routes. Archaeologists are therefore able to study hard evidence and produce distribution maps by "joining the dots", but in maritime distributions there are few dots to join. Maritime distributions may be hard to map topographically (as Parker has pointed out), nevertheless, the arguments set out in this thesis have emphasised the great advantages to be gained, for example, by direct shipment of olive oil from Southern Spain to the west of Britain. This choice not only eliminates multiple loading and unloading of vessels, with consequent opportunities of breakage and pilferage, but also results in a significant reduction in administration. Combined with a reduction in the distance travelled and the cost-ratio advantage of sea, as opposed to river and land transport, it is difficult to conceive that the Atlantic route was not the preferred option

The size of the population

The population of Roman Britain is notoriously difficult to estimate (for example, see Millett 1990, 181-6), but this is a vital factor in any calculation of consumption, and therefore the need for transport. This at first appeared to pose a serious problem, but it was eventually realised that the rural population, whatever its absolute size, was a very occasional and limited user of imported consumer products such as olive oil and wine, and was self-sufficient in terms of its basic food supply. The size of population of the military, at various periods, is determinable from the archaeological evidence of occupied fortresses and forts, a reasonable estimate of military dependents may be made from the excavations of *canabae* and *vici*. There is sufficient evidence of the extent of urbanisation to produce a population estimate for this sector and, although there are undoubtedly many villa sites still awaiting discovery, the size of population is capable of derivation.

The impact of population size on the demand for water transport is considerable, particularly as significant variations over time took place. For example, the closure of many forts, consequent on the redeployment of troops to the north of England during the time of Hadrian, meant that there was no Roman military presence between Caernarfon in the north and Carmarthen in the south, with the whole of the west coast of Wales no longer requiring a significant supply of material, either by land or sea. By contrast, during the 3rd and 4th centuries the development of urban settlements and villa estates in south Wales and the Severn Valley, led to an upsurge in demand that could, in many cases, best be met by water transport.

Demand, supply and the volume of shipping

Having established the population of the various sectors of population, it is possible to estimate the levels of demand and consumption, and then proceed to an assessment of the volume of shipping in the study area.

The term "Romano-British period" has been used throughout this thesis but does, in fact, tend to obscure the diverse fabric of a period of almost four hundred years. Whilst the rate of change was less dramatic than that of recent times, there is clear evidence for major variations of supply and demand, with a knock-on effect on the volume of shipping. This was, to a large extent determined by the predominant economic effect of the garrison, ranging from some 20,000 soldiers plus dependents, in the late 1st/early 2nd centuries and declining to as little as 4000 in the late 4th century. Whilst this was the most significant determinant, other factors have needed to be taken into account, for example, the virtual cessation of imports of olive oil during the mid/late 3rd century.

The first two centuries AD demonstrated the peak of the Empire's sea transport systems, but from the evidence of a rapid the decline in Mediterranean shipwrecks from the 3rd century AD, Parker (1984, 110. *Fig.* 4) concluded that the effects of internal and external insecurity, coupled with financial instability, reduced the volume of long distance trade. This situation is, to some extent, paralleled in the study area, as the graphs of consumption in Figures 11.1 - 3 indicate. For example, from a peak at the beginning of the 2nd century, imports of wine had fallen by 60%, and of olive oil by 80%, at the end of the 3rd century. The quantity of grain imported from within the Province had experienced a similar decline. As a consequence, the annual requirement of over 900 shiploads of these products had fallen to less than 200 shiploads, over the same period. However, the military demand had, to some extent, been transferred to the north of Britain, and the shippers and their vessels were redeployed to reflect this change of emphasis.

<u>*Directions of future research*</u>

Clearly, the first priority is to extend the area of research to cover the whole of the coasts and rivers of the west of Roman Britain. Preliminary research indicates certain differences, for example, the apparent absence of forts on the 350 km long coastline from the Solway Firth to the estuary of the River Clyde. Also, unlike the majority of forts in the present study area, the forts of the Lake District and the Solway Firth are sited directly on the coastline, not well inland. There is also the interesting possibility that the fort at the head of Windermere may have been directly supplied by sea. There will be an opportunity to study through traffic on the Irish Sea, engaged in the supply of Hadrian's Wall and, though the North Channel and the Firth of Clyde during the short-lived duration of the Antonine Wall.

The concept of a chain of fortlets, with a maritime purpose, running along the coast of the Southwest Peninsula, is worthy of further study. The Cornwall Archaeological Unit have identified a number of features, similar in size and topography to the fortlets at Old Burrow and Martinhoe, and amusingly described as "square rounds". Many of these are well inland, but an examination of aerial photographs of coastal locations may suggest locations for further study. Unfortunately, it is difficult to suggest a method of finding direct evidence supporting the hypothesis of combined operations on the west coast of Wales.

Conclusion

This thesis has, to some extent, diverged from the well-beaten track of Romano-British history, so it is perhaps appropriate to end with a quotation from the (1993) Annual Caerleon Lecture (*In Honorem Aquilae Legionis II Augustae*).

> "We must recognise that our land-bound experience restricts our thinking. Railways and motor transport have virtually killed river, canal and coast-wise traffic for people and goods alike, so that substantial areas of water, like the Bristol Channel or the Irish Sea, now divide people whom they once linked. The point is doubly important because we easily neglect the possibility of "combined operations", and because North and South Wales each had closer links with neighbouring parts of England than they had with the other".

Regrettably, Michael Jarrett's death prevented possible expansion of this concept. It is hoped that this thesis may go some way to developing the theme.

Ancient sources quoted, and abbreviations used

Ammianus Marcellinus *(Amm. Marc.)*	
Appian *(App.)*	Roman History (*Hist.*)
Arrian *(Arr.)*	*Tactica (Tact).*
Aurelius Victor *(Aur. Vic.)*	*Caesares*
Caesar *(Caes.)*	*Bellum Civile (BCiv.)*
"	*Bellum Gallicum (BGall.)*
Dio Cassius *(Dio. Cass.)*	
Claudius Claudianus *(Claudian)*	*Panygerics – Stilicho (Stil.)*
Eutropius *(Eutr.)*	*Breviarium ab urbe condita (Brev.)*
Frontinus *(Frontin.)*	*Strategemata (Str.)*
Josephus *(Joseph.)*	*Bellum Judaicum (BJud.)*
"	*Antiquitates Judaicae (AJ)*
Livy *(Livy)*	*Epitomae (Epit.)*
Lucan *(Luc.)*	
Pliny *(the Elder)*	*Naturalis Historia (HN)*
Pliny *(the Younger)*	*Epistulae (Ep.)*
Plutarch *(Plut.)*	*Vitae Parallelae (Vit.)*
Polybius *(Polyb.)*	
Sallust *(Sall.)*	*Bellum Iugurthinum (Iug.)*
Statius *(Stat.)*	*Silvae (Silv.)*
Strabo *(Strab.)*	*Geography*
Suetonius *(Suet.)*	*Divus Claudius (Claud.)*
"	*Divus Iulius (Iul.)*
"	*Divus Vespasianus (Vesp.)*
Tacitus *(Tac.)*	*Agricola (Ag.)*
"	*Annales (Ann.)*
"	*Germania (Germ.)*
"	*Historiae (Hist.)*
Ulpian *(Ulpian)*	*Digesta (Digest)*
Vegetius *(Veg.)*	*De re militari (Mil.)*
Velleius Paterculus *(Vell. Pat.)*	
Vitruvius (*Vit.*)	*De Architectura (De Arch.)*

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Appendix 1. Data-base of locations on the coasts, estuaries and rivers accessible by sea-going ships, coastal vessels, barges and local craft

Introduction

In order accurately to assess the nature of supply and replenishment of the military and civilian settlements in the study area, all sites that may have been supplied by water transport were visited. From the considered limit of navigation, all bridging points down-river were visited, and, based on a long experience of small boat handling on the coasts and rivers of Wales, the Irish Sea and the Bristol Channel, a balanced judgement was made as to the probability of access by water transport.

When considering the problems of supply and replenishment, the most significant factors are location in relation to alternative routes of supply, size of garrison, population of civilian settlements, significant periods of construction, and periods of occupation and abandonment. Fortunately, for the purposes of this study, even the less sophisticated archaeological investigations of the later 19th and earlier 20th century recovered sufficient coins and pottery to provide dating evidence. They uncovered adequate details of foundations of buildings and walls to give information on size and construction details; and recovered dedicatory and funerary inscriptions giving, in many cases, the types, strength and periods of occupation of specific military units.

The overall structuring of the data, and the detail of the individual items, is the result of several attempts at finding a cohesive and readily understandable method of presentation. The first, and perhaps most obvious, attempt grouped the individual sites on a geographical basis. This had the advantage that all locations, whether military or civilian, were presented in a manner illustrating the traffic on a particular stretch of coastline or river. However, this method had the disadvantage of obscuring patterns of size, and therefore demand, and changes over time resulting from the ebb and flow of military occupation, or the growth of civilian settlements. On the River Usk, for example, the legionary fortress of Caerleon and its associated canaba supported a population of perhaps as much as 10,000, or as little as 1,000, at different times between the late 1st century and the late 3rd century, but by the beginning of the 4th century the fortress and the canaba had been virtually abandoned. Clearly, this variation had a massive effect on the amount of transport required to supply the needs of the garrison. Some 35 k upstream, the fort at Abergavenny was occupied from the second half of the 1st century until the early 2nd century but, when the fort was abandoned, the site found a new role in the iron industry and, in effect, changed from the function of consumer to that of supplier. An attempt to structure by time was equally unsuccessful, as this resulted in not only a grouping together of locations of dis-similar function and size, with widely varying patterns of supply and demand, but it also created considerable confusion because of the varying periods of occupation. Somewhat reluctantly, it was decided to settle for a conventional grouping by fortress, fort, city, small town and settlement, and to alphabetically place these categories in the series of time-frames as shown in the text. This in itself has several disadvantages, notably the appearance of a single site under more than one heading, (for example, consider the case of Abergavenny mentioned above), also the fact that geographical identity is obscured. However, it is hoped that the maps provided within the main text (Figures 10.1-10.5) will go some way to aid the problems of interpretation and clarification.

The entries for individual sites have also presented a variety of problems, not least in selecting the level of information to be included. For example, there are plans available for the majority of the forts in the study area, in many cases based on early excavations, but in a large number of cases they owe as much to the inspired use of the dotted line, as to firm archaeological evidence, and therefore only some of the more reliable specimens are included. There is also considerable variation in the size of the entries for individual locations, with extra space being allocated to recently excavated and published forts such as Caernarfon (Casey & Davies 1993) and Loughor (Marvell & Owen-John 1997). By contrast, a single sentence covers Whitehouse Farm, where the only evidence is a series aerial photographs showing crop marks of a pair of ditches with rounded corners, whereas the nearby campaign base at Clyro, of similar size and period, has sufficient information to justify a full paragraph. In some cases it has been decided to concentrate on specific aspects of a location, and this is typified by the information presented for the two permanent fortresses. Because of the information available from recently published work (Mason 2002), the entry for Chester concentrates on the most significant periods of occupation and disuse, whereas the entry for Caerleon is able to focus on the role of the *canaba*, because of the excellent excavation report on the civilian settlement (Evans 2000). More attention is paid to the early fortresses at Kingsholm (Hurst 1985) and Usk (Manning 1981) than is usually the case, as it is arguable that, in terms of active military operations, their significance was greater than that of the later permanent locations at Caerleon and Chester. The relationship of a site to the extensive system of Roman roads is important when considering the relative merits of road or water transport, and each site entry contains this data. Clearly any evidence for maritime activity is of major importance, whether direct or indirect, and is referred to in the site entry. Indirect evidence is demonstrated, for example, by the use of Bath-stone at Kenchester and of Cheshire sandstone at Carnarfon. Examples of direct evidence include the 3rd century quay at Caerleon (*Figure* 2.4) and the tombstone from Chester commemorating a soldier who was lost in a shipwreck (*Figure* 5.2).

Fortresses

Caerleon (ST 340906) Isca

Late 1st/early 4th century legionary fortress (20.5 ha.) - 2nd Legion

Trans-shipment to barges was needed to supply the existing legionary fortress at Usk, and it is clear that the move to Caerleon was intended to provide food and munitions to the army on campaign, through a base accessible to sea-going ships. The fortress was located on the River Usk, the Roman *Isca Fluvis,* 14 km from the sea, with the present tidal limit a further 11 km upstream at Newbridge-on-Usk. The chosen site was at a good bridging point over the river, and perhaps the lessons learnt from Kingsholm, Usk and Clifford were applied, as the location was on gently elevated ground, clear of the flood plain and with a suitable gradient for sewers and drains. Standing on the line of the *via praetoria,* the Roman bridge was located 300 m up-river of the early 19th century stone bridge, and in medieval and later times, merchant ships sailed from quays on the riverside to Bristol, Ireland and many of the Atlantic coast ports. Excavations directed by Boon in 1963 revealed a well-built stone and timber quay (*Figure* 7.3), lying 230m from the present line of the riverbank, at a height of 6.56 m above Ordnance Datum. It is extremely unlikely that it was the only quay, since it was not constructed until the early 3rd century, and there must have port facilities from the time of foundation of the fortress. Based on data obtained from the excavation, there have been a number of attempts to ascertain the level of tidal heights during the Roman period (Boon 1978, 24-36; Waddelove & Waddelove 1990, 253-66; Toft 1992, 249-54) and because of the importance of this factor in considering access by water, not only at Caerleon but also at other ports in the study area, this matter is discussed in some detail in Chapter 2. The fortress covered an area of 20.5 ha., and when first built about AD 75 the defences were of turf, clay and timber, with the bank being fronted with a wall of mortared masonry, the gate towers being replaced in stone by AD 110. The baths were constructed around AD 80 and were refurbished thirty years later, with a major reconstruction being carried out in about AD 170. An amphitheatre with seating for 6000 was built around AD 90, the lower part built in stone, with an upper timber grandstand.

When Hadrian commenced the great frontier wall across northern Britain in AD 122, a large part of the Roman army in Britain was drafted to the north, and inscriptions from the Wall record the work of seven out of the ten cohorts of *Legio II Augusta.* When the Roman frontier was advanced into southern Scotland under Antoninus Pius, a further series of inscriptions show that much of the legion was still on the northern frontier. Vexillations of the legion were often employed on the continent as is demonstrated by the cenotaph of Tadius Exuperatus, a locally born soldier of *legio II Augusta,* who "died on the German expedition" (*RIB* II, 369). The absence of a large part of the legion has considerable implications for the amount of shipping required for supply and replenishment and this is discussed in Chapter 9.

There is limited archaeological evidence for the continued occupation of perhaps one barrack block per cohort during this period, but the fortress became a regimental base depot rather than an active military garrison (Knight 1988, 14-15). The restoration of the headquarters building, under Severus and his sons Caracalla and Geta, is recorded on an inscription found in the churchyard at Caerleon from AD 211. At about this time the amphitheatre was remodeled, barrack blocks were repaired and re-roofed, and an inscription found near the southwest gate records its restoration under Caracalla. The Fortress Baths were still in use until about AD 235, perhaps under the supervision of a care and maintenance unit, there is a dedication by the *primus pilus* of *II Augusta* dated to AD 244, it is known that when the 7th Cohort returned in AD 253-8 their barracks needed to be totally rebuilt, and a recently discovered inscription records further building activity under Aurelian in AD 275.

An inscribed stone from Gold Cliff on the Caldicot Level records the completion of 33 paces of work, by the century of Statorius Maximus of the 1st Cohort of the 2nd Augustan Legion, and this may have been part of the reclamation of land to enlarge the *territorium* of the legion, without encroaching on the lands of the *civitas* at Caerwent.

Zienkiewicz (1986, 258-265) draws attention to "widespread indications of a thorough dismantlement of the legionary fortress in the last years of the 3rd century", but also points out that parts of the site were to continue in occupation through most of the 4th century. Boon considered that the "generally squalid and traces of habitation" were of civilian rather than military origin, and occurred after the legion had entirely departed from Caerleon (1972, 66). A deeply-stratified sequence of 4th century material found in the *piscina* of the Baths was rich in pottery and well dated by coins, but "demonstrated a total disregard for the upkeep and cleanliness of the buildings". The presence of a complete skeleton of a young lamb in the filling of the drain indicates animal husbandry in the immediate area, and a probable emphasis on a pastoral economy among the inhabitants. The general squalor of 4th century occupation, suggesting the inhabitants were little more than poor squatters and scavengers living in the derelict ruins of the fortress is, to some extent, countered by the quantities of pottery and coins from the dump at the *piscina*, as it shows that these people had access to a market economy and had both the use for, and wealth to afford a variety of fine colour-coated table wares (Zienkiewicz 1986, 259).

Gerald the Welshman (*Giraldus Cambrensis*), writing in AD 1191, explained that Caerleon was the *Urbs Legionum* (City of the Legions). He stated that "it was wonderfully built by the Romans in olden days with brick walls. You may observe here many surviving traces of its former grandeur: immense palaces imitating Roman pomp in the gables of the rooms which were formerly gilt, inasmuch as it has been observed that they are supposed to have been constructed in the first instance by Roman princes, and adorned with splendid structures; a gigantic tower, remarkable baths, remains of temples, theatrical places, all these enclosed by marvellous walls still in parts standing. You will find everywhere, inside the circuit of the walls as well as outside, underground structures, watercourses and subterranean channels; and what I thought worthy of note, you may see on every hand stoves put together with wonderful craftsmanship, certain lateral and extremely narrow vent-ducts secretly exhaling the heat". However, excavation (Boon 1960-76; Evans 1982; Zienkiewicz 1964-9) has indicated that deposits datable by medieval pottery rest directly upon the latest Roman surfaces with, for example, part of a medieval, green glazed pot lying trampled and crushed into the gravelled Roman surface next to the *natatio*, and therefore no evidence for any continuing occupation between the end of the Roman period and the mid 13th century.

Chester (SJ 402658) - *Deva*

Late 1st century/late 4th century legionary fortress (24ha.) - 2nd /20th Legions

By the mid AD 70s, a major base was needed to the northwest of the existing fortress at Wroxeter to control the newly occupied areas of North Wales and the western Pennines. A new legionary fortress was therefore built on the River Dee at Chester (*Deva*) and, like most Roman fortresses in Britain; it was placed near the lowest convenient crossing point and/or highest navigation point of a large river. However, it has been recently suggested that there is evidence for pre-Flavian activity, albeit on a much smaller scale (Mason 2002, 33-4), and this might indicate Chester as a base for naval action in support of campaigns in the northwest, during the governorship of Quintus Petillius Cerialis (AD 71-3).

In any event, it is probable that, from its conception, maritime use was a strong consideration as there was a deepwater channel at Chester, and there is a possibility that there was a naval base at Chester, supporting Agricola's campaigns in the AD 70s. Wooden jetties that extended well out into the river, in association with 2nd century Roman material (Shrubsole 1887, 80), and there is the probability that these were later rebuilt in stone (Mason 2001, 190-1). Shipping by coastal trading in and out of the port is demonstrated by the amount of Welsh slate in stratified Roman contexts, identified as originating at quarries near Caernarfon, and traffic in the opposite direction has been shown by Cheshire sandstone found at Caernarfon and Caerhun. Significant channel changes that have taken place in the Dee Estuary and these, together with the effect of probable changes in tidal levels since the Roman period, are discussed in some detail below. The fortress was constructed, and initially occupied, by the 2nd Legion (*Adiutrix Pia Fidelis*) but this Legion was moved to the Danube frontier by AD 88. It was replaced by the 20th Legion (*Valeria Victrix*), earlier commanded by Vespasian in his campaigns in the southwest of England. It is not known precisely when work on the fortress began, but lead water pipes suggest that construction may have been coming to an end by AD 79 (Carrington 1994, 24-32), as the inscription reads "IMP VESP VIII T IMP VII COS GN IVLIO AGRICOLA LEG AVG PR PR" (Made when) "the

Emperor Vespasian was consul for the ninth time and Titus, acclaimed imperator, was consul for the seventh time, in the governorship of Gnaeus Iulius Agricola".

Attention has been drawn to the large size of the fortress (at 24 ha. some 20% greater than York or Caerleon), and the presence of high status public buildings such as the so-called Elliptical Building. Mason (2002, 39-50) suggests that this might indicate some special role for Chester and, of the various options, considers that this might have been as the headquarters of the provincial governor. As was the case with the two other British legions, a significant part of the garrison was on detachment to Hadrian's Wall in the AD 120s, followed by the reoccupation of southern Scotland in AD 140. The 20th also took part in the building of the Antonine Wall, between the Forth and Clyde, and in garrisoning this territory. The absence of troops, who were serving in the north, led to construction being suspended with some buildings still incomplete, and some of the existing barrack blocks appear to have fallen into a semi-derelict condition, with evidence for extensive dumping of refuse in a number of barrack blocks, with metal working waste and debris being found in another, and in the *canabae* the *mansio* was used as a rubbish dump, clearly indicating a period of virtual abandonment. Some elements of the Legion remained at Chester, but it seems unlikely to have functioned as a conventional legionary depot. Strickland has suggested that it may have been retained as a rear works depot, in which equipment would have been repaired and manufactured for the army operating in the north over a period of some 70 years. This hiatus continued into the early 3rd century, at which time Chester once again resumed its role as a legionary fortress (Strickland 1999, 105-9; Hoffman 2002, 79-88). At this time almost every building within the fortress was reconstructed, many from ground level, the "Elliptical Building" that had remained unfinished since the 1st century was completed and there was a complete rebuild of an extremely large building, 65 by 157 m, but no satisfactory explanation for its utilisation has yet been produced.

Thompson (1965, 29) assumed that the western defences of the fortress were destroyed shortly after the beginning of the 4th century, suggesting a *terminus post quem* for the fortress as a defensive structure. However, Hoffman (2002, 80) points out that in AD 893/4 the Danes were able to hold out against the Saxons inside the fortress for two days, indicating that at that time the walls were still intact, and Strickland has convincingly argued that the destruction mentioned by Thompson was more likely to have occurred when the City Walls were extended to the Dee in the medieval period (1994, 8-10).

The *principia* appears to have been re-floored in the 4th century (Carrington 1994, 34) and Ward points to evidence for a period of occupation at some date around the end of the 4th century or later (1988, 28) suggesting that this might indicate that the headquarters building continued in intensive use. The Elliptical Building has evidence for rebuilding during the 4th century (Mason 2000, 143-9); Strickland and Ward consider that the store building to its north remained standing, acquiring a number of timber structures in the latest Roman period (1994, 12) and that the granary in Hunter Street was still functioning at that time. It is probable that the main fortress baths continued in operation until the end of the 4th century and that the small bathhouse to the south of the Elliptical Building was also operational, "suggesting that the fortress continued to enjoy a comparatively high standard of living, as it was certainly able to provide bathing facilities for a large number of people" (Mason 2000, 150-1). There is evidence for both demolition (Thomson 1965, 36) and reconstruction (Ward 1994, 22, 29 and 70) of several of the barrack blocks, but a dramatic reduction in settlement size is indicated by the fact that many excavated sites appear to show a complete absence of archaeological material dating to the second half of the 4th century or beyond (Hoffman 2002, 82).

There is no record of the 20th Legion after the time of Carausius (AD 287-93), it could have been withdrawn from the province or amalgamated at any time in the 4th century. A complicating factor in deciding on the level of military occupation in the later Roman period is the diminishing size of the legions and auxiliary units, and Tomlin (2000, 172) suggests that, by the 4th century, the strength of a legion was only about 400 soldiers, and that of a cavalry unit was much less than 100. At Chester, there is a significant decline in coins after AD 360, but even prior to that date any occupation could have been administrative, rather than military (Carrington 1994, 24-44). Strickland considers that the evidence for demolition suggests that the legion left Chester at about the end of the 3rd century and that the site became a civilian town, perhaps with some small military component, and operated as the capital of one of the later Roman British provinces (1984, 30-5). The fort at *Segontium* was occupied until the end of the 4th century, as is demonstrated by a coin of the Emperor Theodosius 1st (379-95), but Caernarfon is 95 km to the west of Chester, and would have not been able to provide timely military support, therefore arguing for a continuing military presence in some parts of the fortress. There is perhaps no need to invest Chester with the status of a Provincial Capital (see above) - there is no archaeological or epigraphic evidence to suggest that this was the case, but it would have been well-placed to function as an administrative centre for the modern counties of Cheshire and Flintshire.

Gloucester (ST 830180) *Glevum*

Mid/late 1st century legionary fortress (17.4 ha.) - 2nd Legion

Which legion built the fortress and subsequently occupied it is uncertain. On the assumption that construction started after AD 66, it could not have been the 20th Legion, which by that time was in Wroxeter. The most likely suggestion is that part of the 2nd Legion moved from Exeter for the construction and initial garrisoning of the fortress, and that the remainder of the legion moved up at a later date, as part of the movement into South Wales in AD 75 (McWhirr 1981,19). In one of the partition walls of a barrack block, a coin dated to AD 64-66 was found, showing that it was not built before that date, and pottery and coins from within the barrack blocks indicated that occupation lasted until AD 87-8. The fortress was re-furbished in the late 80s, with some rebuilding in stone and the defences being re-faced with a dry-stone wall. Military occupation seems to have ceased during the 90s, with the conversion of the site to the *Colonia Nervia Glevensium* under the Emperor Nerva (AD 96-8), and there is evidence of civilian occupation of some of the military buildings before the site was probably cleared and rebuilt.

Kingsholm (ST 835195)

Mid 1st century legionary fortress - 20th (?) Legion

Kingsholm lies on a gravel terrace on the east side of a former major course of the River Severn, now a party culverted stream (the Twver). It is probable that in Roman times the Severn was divided into two channels of more or less equal size, spaced about 1.5 km apart, with a flood plain of alluvium silts between them (*Figure* 7.4). From finds of early Roman military antiquities, a fortress at Kingsholm has been known since the 18th century, for example, with Claudian copy coins being reported by Lysons in 1817. In 1972 a limited excavation was carried out by Hurst (1985), and subsequent small-scale excavations in gardens, building sites, and salvage recording of service or foundation trenches, have revealed a significant amount of further information (Garrod and Heighway 1984). It is probable that the main east-west route used in the early campaigns against the Silures would have extended up to, or crossed, the Severn at Kingsholm, without any permanent military presence at the crossing point.

At some time from AD 49 onwards, a permanent military presence, of either a fort or fortress, was built on the east bank of the river to defend the crossing. Kingsholm controls a major north-south communication line on the east bank of the Severn, extending from Sea Mills (*Abonae*) up to the West Midlands and Watling Street. Two military tombstones have been found nearby at Wotton, some 1.2 km from Kingsholm. The first commemorated Rufus Sita, a trooper of the 6th cohort of Thracians, probably a *cohors equitata,* and the second tombstone, now lost, was that of a soldier of the 20th Legion. If these tombstones are, in fact, associated with Kingsholm, it would indicate a mixed force comprising legionaries and auxiliary troops, a grouping now shown to have been a regular feature in southern Britain during the first 30 years or so of the Roman occupation. As a result of the excavations and the location of military finds in the area, Hurst suggests (1985, 117) that the whole range of standard military sites from *cohors quingenaria* or *ala*, to legionary fortress are possible.

Early coins included a *denarius* of Claudius and one of Tiberius, six coins of Nero and 18 Claudian copies, and "seem to have a diffuse beginning but a very firm end" (Reece 1985, 22). This comment is justified by the absence of bronze coins of Vespasian, with the coins of Nero having three before AD 66 and two after that date, so that the end of the date of coin supply to Kingsholm is clearly between AD 67 and 71 and Reece therefore gives a date range for coin use on the site as from AD 55 - 68. A group of 12 later coins, ranging from AD 260 to 360 are probably "part of the inevitable scatter of rubbish found around the suburbs of most Roman towns" (*ibid.*) and this ties in with a number of inhumation in the area, showing that Kingsholm became a major cemetery of Gloucester during the late Roman period.

Tacitus's statement (Annals XII, 32) that *"Silurum gens non atrocitate non clementia mutabantur, quin bellum exerceret castisque legionum premenda foret"* ("Neither sternness or leniency prevented the tribe of the Silures from fighting and the need to suppress them by a legionary camp"), has been suggested as specific evidence for the establishment of the fortress at Kingsholm. However, Hurst suggests over-interpretation, and that it could simply mean "The Silures were an uncontrollable nuisance and needed the army to hold them down".

It has previously been supposed that the move of 1 km to a new fortress, at what is now the centre of modern Gloucester, was probably occasioned by localized flooding at Kingsholm (e.g. Wilson 2002, 171). However, Hurst drew attention to Roman habitation levels at c. 9 m A.O.D or below, to the south of the main Kingsholm site (1985, 3), and that habitation levels to the west of the later *colonia* lie between 8.2 and 9.2 m A.O.D. (1974, 48). He goes out of point out that if Kingsholm flooded, so did a substantial part of the Roman settlement at Gloucester and that the move is more likely to have been as the result of the location of a more favourable natural river crossing (1985, 122).

Usk (SO 379007) *Isca*
Mid/late 1st century legionary fortress (c. 20 ha.) - 20th/2nd Legions

Probably during the Governorship of Aulus Didius Gallus (AD 52-57) a new legionary fortress was built for the 20th Legion at Usk, on the site of a pre-Flavian fort. Shown as *Burrium* in the Antonine Itinery, the location is 34 km from the Bristol Channel and 9 km north of the present tidal limit, at a point on the banks of the Usk where the main road from England, running to the north of the Forest of Dean, entered the Usk valley (Margary 62a and 612b). This position controlled the road south to the coastal lowlands, and north to Abergavenny and the hills of Breconshire, and the siting of the fortress at this point was clearly for strategic reasons, but the site was liable to flooding, and was too far inland to be supplied directly by sea. Manning's comment (1969, 116) that "Shallow draught vessels might well have been able to navigate the Usk as far as the town in Roman times" implies trans-shipment at some point nearer to the sea. This suggestion of limited navigability to Usk is perhaps supported by the present-day existence of a "Barge Field", where, within living memory, this type of craft was built (Mein 2001, pers. com.). Three barrack/stable blocks suggest an auxiliary cavalry unit being stationed in part of the fortress and Marvell (1996, 85) supports this by arguing that the 120 mounted troops (*equites legionis*) of a legion, together with the horses for the legate and other senior officers, would have been stabled in specialist accommodation in the fortress and that in any case the provision of three stable blocks was too large for the number of legionary horses.

The later presence of the 2nd Legion is attested by the recovery of two tiles bearing a *LEG II AVG* stamp. The construction of the new fortress at Caerleon (AD 73-4), some 12.8 km further down the River Usk, would have made the base redundant, and led to abandonment and demolition of some buildings taking place in c. AD 75 and Manning suggests that, although the Usk was not navigable for large vessels, reusable material from the site was probably transported down river to the new fortress (1981, 46). It has been argued (Marvell 1996, 86-9) that a 1.5 ha walled area within the abandoned fortress, constructed c. AD 85, may be a works depot for the 2nd Legion, then based at Caerleon, and/or a centre under military control for the administration of industrial exploitation of the region, with final abandonment taking place c. AD 120-5.

The *vicus* lying outside the fortress developed into a small settlement after the closure of the fort and later expanded into the site of the fortress, serving as a market centre for agriculture and a source of tools and equipment, with iron working becoming an important element in the economy. Several small hearths were probably used for the reprocessing of lead, as lead sheeting (some with nails still attached), lead splash and two lamp-holder wasters were found in association (Marvell 1996, 72).

Wroxeter (SJ 564086)

Mid/late 1st century legionary fortress (c. 20 ha.) - 14th / 20th Legions

Wroxeter lies on the road along which the army moved its troops and supplies for the final battle against Caractacus (wherever that might be precisely located), and would have been a convenient location for a base from which to conduct operations. The earliest military presence was probably at Eaton Constantine, 6 km to the southeast, where there are marching camps and a large 4 ha fort. An elongated double-ditched fort is located at Duncote, 2 km to the north; a normal sized auxiliary fort was situated 1 km to the south on the bank of the Severn, and a legionary fortress on the site of the later Roman city. The fortress, constructed by the 14th Legion, was established about AD 58 under Quintus Veranius, a young and vigorous commander sent by Nero to settle the problem of the Welsh tribes. The site of the defences of the fortress was eventually identified in 1975, and pottery associated with the military levels indicates continued occupation until about AD 90. The latest military buildings are different in character from the normal fortress layout, and it is likely that the function had been changed to become a depot for administration, storage and training, while the legion was actively engaged in the northern campaigns under Agricola. The fortress remained in being after the final withdrawal of the 14th Legion from Britain in AD 69, the new garrison being the 20th Legion, previously based at the Kingsholm site at Gloucester. It is presumed that the 20th remained at Wroxeter until it was taken into Scotland by Agricola in c. AD 80, where it constructed a new base at Inchtuthill in Perthshire and probably never returned to Wroxeter, except to carry out the final demolition of the fortress.

Forts established by AD 75

These forts were established during the campaigns of the following Governors.

AD 47-52	Osturius Scapula conquers the Deceangli in North Wales, then campaigns against the Silures (south Wales) and the Ordivices (mid and north Wales). Led by Caractacus they are beaten in battle in AD 51.
AD 52-7	Only minor "policing" actions in Wales, but major programme of fort building and re-deployment under Didius Gallus.
AD 57-8	Quintus Veranius conducts major campaign against Silures, but dies within a year
AD 58-61	Ordovices suppressed in north Wales by Suetonius Paulinus, but forced to retreat from shores facing Aglesey by revolt of Boudicca (AD 61).
AD 61-71	Possible final conquest of Wales prevented by withdrawal from Britain of 14th Legion for Nero's intended war against the Partians.
AD 71-4	Petillius Cerialis arrives with 2nd *Audiutrix* Legion and secures north-west England, enabling resumption of conquest of Wales.

Abergavenny (SO 299140) - *Burrium*

Mid 1st/mid 2nd century auxiliary fort

The fort lies on the brow of a low spur, 500 m to the north of the River Usk, blocking the valley where the River Usk passes between the Black Mountains and the Brecon Beacons. The fort lies at the junction of the road from Brecon Gaer to Caerleon, with a branch road leading to Kenchester (Margary 65, 75). As only very limited excavation has taken place, with a small granary and a short length of the defences being located, it is not possible to determine the extent of the fort or its garrison. The majority of datable finds from the site are from the late 1st to mid 2nd centuries, but a small quantity of Claudian pottery suggests that Abergavenny was the site of an early fort, established during the course of campaigning against the Silures (Jarrett, 1969, 45/6). The postulated stores depot at Usk (Marvell 1996, 86-9), would have provided an incentive for the improvement of the river up to Abergavenny, and perhaps beyond to Pen-y-Gaer.

Abertanant (SJ 248214), Llansantfraid-y-Mechain (SJ 229207)

Mid 1st century auxiliary forts (0.9 and 1.1 ha.)

Situated on the River Vrnwy, a tributary of the Severn, Abertanant was recognised from aerial photographs in 1976, and two separate sites were identified. There is no evidence for a Roman road in the area, and supply and replenishment along the Afon Vrnwy, from its confluence with the River Severn some 12 km to the southeast, is probable.. The site occupies a low-lying and tactically disadvantageous location, usable only in the drier months and dominated by Llanymynech Mountain. The first fort covered an area of 0.6 ha., with a wide defensive ditch, timber gate, box rampart and *titulum*, but no interior structures were located. A ditch surrounded the second fort, covering c 0.9 ha., and the remains of a timber-revetted rampart were identified. Within the defences, six timber buildings were revealed, four of which might have been barracks. Jones (1988, 417; 1989, 259; 1991, 223-4) has suggested the Llanymynech hill-fort as the site of the final defeat of Caractacus, and believes that the Abertanant camps form the first evidence for a Roman campaign presence related to a major strongpoint in Wales. An excavation report has not been published, and it is understood that no dateable artefacts have yet been identified (Jenny Britnell 1998 *pers. com.*). The nearby 1.1 ha fort at Llantsantfraid-y-Mechain, Meliniog was subject to limited excavation in 1987, a probable barrack building and granary with loading bay were located within a polygonal double ditched enclosure, and the excavator identified the site as a military supply depot (Jones 1988, 417-9).

Charterhouse (ST 500565) - *Veb.*

Mid-1st /early 2nd century fortlet

Excavation in 1993-4 revealed the remains of a small fortlet, measuring 55 m by 50 m, with pottery ranging from the mid 1st century to the early 2nd century. Below this lay an earlier fortlet, with Samian ware and amphorae indicating a Claudian fort of the period c. AD 45-55. A fortlet in this location would have little tactical significance, and its function was most probably for the administration and control of the mining activities.

Chepstow (ST531942)

Probable 1st century auxiliary fort

Chepstow is located on the west bank of the River Wye, some 4 km from its confluence with the Severn estuary. On the coastal road from Gloucester to Caerleon (Margary 60A) and all and with the the provenance of a road to Monmouth (Margary 6D) runs northwards. Jarret has suggested, "early material from Chepstow may be a pointer to another pre-Flavian fort" (1994, 25) and 1st century coins, pottery, metal horse-trappings and early burials suggest a fort guarding this key crossing of the Wye (Shoesmith 1991). There is nothing to be seen of the (presumed) Roman bridge at Chepstow, but from time to time, in exceptionally low water, some timbers have been reported in this locality. In 1911, excavations exposed what were believed to have been vertical posts of the Roman bridge and in 1962 some pieces of wood were recovered and have been lodged in the Chepstow Museum, but they have not been scientifically tested to determine whether they could indeed be of Roman origin.

Clifford (SO 249467); Whitehouse Farm (S0 225430)

Mid 1st century vexillation fortresses (c. 7 ha.)

The campaign base at Clifford, where the positions of the sides, ditches and north and east gates have been determined, lies close to the east bank of the Wye and above normal flood level, but the northern area of the fort is liable to be submerged in exceptional conditions. A further 7 ha. fort lies close by (SO 243456) and is immediately adjacent to the Norman motte and bailey castle. A series of oblique aerial photographs (Musson 2000) clearly show the extensive banks and ditches of the northern corner of the fort. Clifford is only 2.5 km away from the fort at Clyro and is therefore unlikely to be contemporary. It is probable that the forts at Clifford were the earlier, and were replaced by that fort at Clyro; a better site and not liable to flooding. The fact that the Roman road lies on the opposite side of the river suggests that the forts were established before the line of the road was determined, and is a further factor indicating these as the earlier locations.

At Whitehouse Farm , 1 km south of the Clifford fort, crop marks show a pair of straight ditches with rounded corners, extending for 210 m without evidence for a gateway and suggest the presence of another large fort [(*Britannia* 23, 283): (JRS lxiii, 238-9)].

Clyro (SO 227435)

Mid 1st century vexillation fortress (10.4 ha.)

The campaign base 10.4 ha. fort is located 1.7 km away from the village of Clyro, on a hill overlooking the west bank of the Wye. A Roman road has been traced from Kenchester *(Magnis)* to Clyro, and probably continues to Brecon Gaer *(Cicucium)*. This would undoubtedly have been the route taken by marching troops, but the supply and replenishment of the garrison of some 2000 troops would have been much more effectively achieved by water transport. The river is fordable at this point, and there are extensive fields of view in all directions. Hay-on-Wye with its Norman Castle and a history of river transport is close by, and the defences lie within the fields of a farm known as "Boatside". It is probable that an early marching camp of 8 ha preceded the fortress, but this has not been tested by excavation. The few finds from the site include Samian dating to 60 at the earliest, but a flagon neck in buff fabric is probably of Claudian date (Jarrett 1969, 77-80). Jarrett's comment that "the route from Usk to the middle Wye Valley was inconveniently long if reinforcements were needed in a hurry" (1969, 14), appears to be open to question. The base for operations along the Wye Valley at that time would probably have been the early legionary fortress at Kingsholm, and not the later fortress at Usk. However, the extended line of communication from either Usk or Kingsholm was the probable reason for the construction of such a large base, suitable for the brigading together of legionary and auxiliary units.

Martinhoe (SS663493) and Old Barrow (SS788493)

Mid-late 1st century fortlets/signal stations

With a garrison of perhaps a century (80 soldiers) these posts were probably intended to observe hostile naval action in the Bristol Channel when the war in South Wales was at its height. The excavators (Fox & Ravenhill 1965, 253-8) believed that one fortlet succeeded the other, with Old Burrow being established c. AD 48 and then being succeeded by Martinhoe about AD 60 and then evacuated in c. AD 78 on the final subjugation of the Silures. However, Symonds (in Wilson 2002, 96) has pointed out the identical and unusual layout of the earthworks, suggesting that that they are contemporary, but also that the limited pottery finds are not susceptible to such close dating. He suggests that they were intended to operate as a pair, each been responsible for a different part of the coastline. However, see Chapter 6 for an alternative hypothesis.

Monmouth (ST 510130)

Mid 1st /early 2nd century auxiliary fort

Situated on the banks of the River Wye, near its junction with the River Monnow, Monmouth is probably the *Blestium* of the *Antonine Itinery.* Major roads run west to Gloucester (Margary 61) and south-west to Usk and Caerleon (Margary 612B), with a branch road (Margary 612A) leading north-west to the major iron-working settlement at Weston under Penyard (Clarke & Jackson 1992, 1). Finds of early Samian pottery and bronze brooches, probably attributable to the military, meant that a large Neronian fort has long been suspected at Monmouth, Excavation in 1992 revealed a section of military for ditch, with pre-Flavian Samian pottery in the ditch slot.

Nantstallon (SX034670)

Mid-late 1st century auxiliary fort (0.9 ha.)

The fort is situated on the south bank of the River Camel in mid-Cornwall. In comparison with other 1st century forts it is small, less than half the size of those at Pen Lystyn or HodHill, but the excavators found some evidence for cavalry, and suggest a garrison of a *cohors quingenaria equitata*, comprising six centuries of infantry and four cavalry troops. The finds were mainly pre-Flavian, and there were none that need to be later than AD 80, and have led to an initial date of construction during the reign of Nero, AD 54-68. Fox and Ravenhill commented that "the river Camel is tidal and navigable........and so would provide a means for the Romans to bring in sea-borne supplies to within at least four or five miles of the site" (1972, 59). Nantstallon is situated in a district that is rich in metals, with deposits of silver-lead, associated with copper (mined commercially in the 19th century), being present at Lanivet, some3 km from the fort. The discovery of a drop of silver-rich slag, fragments of crucibles and an 8 dram weight indicates that the source had been located, and cupellation was being practiced in the fort. An iron-bearing vein of haematite with banded quartz lies a mile to the east, and evidence of smelting and smithing was found inside the fort (*ibid.* 1972, 90-1)

Morwenstow (SX210139 and High Cliff, St Genny's (SX130945)

These fortlets, on cliff-tops 20 km apart, were located by aerial photography, with only the latter being visible on the ground as a distinct earthwork (Herring, 1994, 235-7). (See also Chapter 6)

Sea Mills (ST760551) - *Abonae*

Mid 1st century fort/port/supply depot (c.2 ha.)

Sea Mills is located on the tidal River Avon, some 6 km from the Severn Estuary, and at the confluence with the much smaller River Trym. To the east there was a major road (Margary 54) leading from Bath (*Aquae Sulis*)to the Fosse Way, and a northerly route (Margary 541) led to Gloucester (*Glevum*) and the Severn Valley.The presence of Claudio-Neronian coins and Samian ware, together with military equipment, led Boon (1949, 184-8) to suggest a military presence. Bennet has suggested that the distribution of finds suggests the location of a probable 2 ha fort located on the plateau to the east of the River Avon, and to the south of the River Trym. Two tiles and one brick, stamped *Leg II Aug* suggest a continued military presence into the 2nd century, at which date of these tiles first occur in the fortress at Caerleon(1985, 3).It is likely that, during the campaigns against the Silures, *Abonae* served as a base for units of the *Classis Britannica* patrolling the Bristol Channel. A ferry service will have operated across the Severn to the fortress at Caerleon in South Wales, probably from Sea Mills, although Rivet (1970, 58) has suggested Aust as an alternative landing place. Military occupation came to an end at about AD 120, and this would correspond with the date of the transfer of a significant portion of the 20th Legion from Caerleon to Hadrian's Wall. Bath-stone was used extensively in the fortress at Caerleon, and throughout southern Britain, and it is probable that this was transported down the River Avon in barges and, together with smaller quantities of limestone from nearby Dundry Hill (used in the late Roman fort at Cardiff), and was shipped from Sea Mills. There are a number of villas in the area that could have produced an agricultural surplus, and as there is no nearby Romano-British town (Bristol did not develop until the 10th century), it seems likely that Caerleon provided an outlet. It is therefore probable that a small port developed, but no archaeological evidence has yet been found (Bennett 1985; Ellis 1987, 15-108)

Sudbrook (ST 504873)

Mid 1st century/? re-occupied promontory fort

Metalwork and pre-Flavian pottery suggest a Roman garrison was installed within the compact (1.2 ha.) ramparts of the Iron Age multivallate promontory fort (Nash-Williams 1939, 42-79), presumably to control a ferry crossing of the Severn Estuary, from the English side to Portskewett. A road (Margary 60aa) runs from Sudbrook to the main Caerwent road at Crick and probably accords with a decision to ship some supplies across the Severn Estuary, rather than by the longer and more circuitous route via Gloucester. Coins recovered from the foreshore at Black Rock span 300 years of Roman occupation, ranging from the Emperor Claudius (AD 43) to one of Gratian struck between AD 367 and 375, and indicate dedicatory offerings from passengers in return for a safe crossing (Brewer 1993, 10).

Weston under Penyard (ST 634235) – *Ariconium*

Two 1st century auxiliary fortlets (Vexillation fortress suspected)

Excavations soon after the First World War (Jack 1923) failed to discover structural evidence for a military phase, but produced pre-Flavian pottery and a number of Claudian coins. The probable existence of fort has been accepted for some years (Webster 1960, 66; Manning 1976, 31) but, whilst accepting that "the archaeological evidence is slight", Manning later considered that a larger military presence, perhaps a vexillation fortress, similar to that at Clyro was possible (1981, 37-8). He drew attention to the similarity with Usk, with the site lying at a point where the road by which supplies and men would have entered the area from across the Severn meets a major river valley. He points out that *Ariconium* would be strategically well-placed, because a strong military presence would effectively block Silurian raids into the Forest of Dean and across the lower reaches of the Severn.

In 1989 an excavation 1 km north of the iron working site at Weston under Penyard revealed two small fortlets, each of about 0.2 ha., one overlying the other and therefore not contemporary. Each fortlet could have accommodated a century of soldiers and the excavators concluded that they should be "viewed as modest sized administrative centres, staffed with a minimum of manpower and supervising the production, supply and distribution of artefacts and forgeable iron, to advance military forts west of the Wye" (Walters 1992, 71).

Forts established after AD 75, but going out of use by the mid-2nd century

These forts were established during the campaigns of the following Governors.

AD 74-8	Julius Frontinus completes over-all pacification of the Silures in series of campaigns, rationalises military dispositions and constructs new forts in conquered territory.
AD 78-84	Final "mopping up", and some fort construction in west Wales by Julius Agricola.

The majority of these forts were abandoned when the auxiliaries were moved north (c. AD 122-130) to stabilize the military situation, and to garrison the forts of Hadrian's Wall. Most of the remainder went out of use (c. AD 139-42), as further soldiers were needed for the re-occupation of southern Scotland and the building of the Antonine Wall.

Brithdir (SH 773188)

Late 1st/mid 2nd century auxiliary fortlet (0.4 ha.)

This small fort at lies south of the Afon Wnion and its confluence with the Afon Mawddach, the tidal limit is at Dolgellau, 4 km to the west, to where sea-going vessels could berth, in the Tudor period (Fletcher 1969, 108-110). The fort is situated at an altitude of 150 m commanding good views of the valley of the Wnion, and lies on the road leading to Caer Gai, some 17 km to the northeast. Extramural buildings, situated within a large polygonal enclosure to the south of the fort, included tanning and metalworking sheds and a bath-house. The site was abandoned about AD 120, the buildings were dismantled, the ditches backfilled, and a road built over the remains. The location of Brithdir is not suitable for the control of the Mawddach estuary, and it is probable that a fort existed to the west, but this has not, as yet, been located.

Bryn-y-Gefeiliau (SH 746572)

Late 1st/mid 2nd century auxiliary fort (1.57 ha.)

This fort at lies on the road running between Caerhun to the north and Tomen-y-Mur to the south, and was clearly intended to control the valley of the Afon Llugwy on whose banks it stands. The river falls rapidly over 5 km to its confluence with the Conwy at modern Betws-y-Coed and a number of waterfalls, the most notable being Swallow Falls, would have prevented navigation along the river. However, the 15 km stretch of the River Conwy between Caerhun and Betws-y-Coed could have been navigable, and would have presented a favourable alternative to the presumed route of the Roman road, running through mountainous country to the north. The fort occupies a level meadow within a broad loop of the river, and stands only a couple of metres above flood level. Pottery found on the site indicates a late Flavian foundation, with occupation lasting into the second half of the 2nd century. The area of the fort indicates that it was probably garrisoned by a *cohors quingenaria peditata* or, at the most, a *cohors quingenaria equitata.* An annexe to the west of the fort covering an area of 1.3 ha appears to have been surrounded by a rampart, and contains a complex of substantial stone buildings, still standing to a height of about 1 m above ground level. The recovery of tiles and short stone pillars indicates a *hypocaust* system and suggests use as the fort baths, later expanded to include accommodation to be used as a *mansio* (Jones 1969, 51-54). At the time of a recent visit, the Gwynedd Archaeological Trust was carrying out a geophysical survey and the results, particularly regarding the site of the vicus, are awaited with interest.

Caerphilly (SO 154873)

Late 1st/???? auxiliary century fort (c. 1.25 Ha.)

The century fort is situated on a mound of glacial gravel, commanding good views eastward down the valley of the Rhymney, towards the mining settlement at Machen and the fortress at Caerleon. The fort is adjacent to the road leading south to Cardiff and north to Gelligaer. As the crow flies, Caerphilly lies only 11 km from the sea, and at first sight appears to be a prime candidate for supply and replenishment by water transport along the River Rhymney, but the tortuous course of the river increases the distance by water to 25 km. However, if the movement of ore from the mining settlement at Machen had merited improvement to the river, further improvements over the remaining 6 km might have been justified. If Caerphilly was, in fact, supplied by water, the River Taff may have provided a viable alternative route. This river is tidal to the fort at Cardiff, and improvements over a further 11 km would have reached a point within 4 km of Caerphilly. There has been only very limited excavation and considerable medieval and later disturbance means that the dating and extent of the fort are largely conjectural, but resistivity survey gave a suggested area of 1.25 ha. (Lewis 1969, 64-5).

Carmarthen (SN 416214) – *Moridunum*

Late 1st/early 2nd century auxiliary fort (1.75 ha.)

Identified from the Antonine Itinerary as *Moridunum,* an early fort was succeeded by the *civitas* capital of the *Demetae.* The fort lay on the tidal estuary of the Afon Tywi (*Tuvius Fluvis*), 15 km from the sea, and beneath the modern town. Roads leading east along the valley of the Twyi to Llandovery, and northeast across hilly terrain to Llanio, have been identified. A road leading westwards towards the coast has been traced over a distance of 42 km, and almost certainly led to a coastal fort or forts, whose sites have yet to be discovered. The fort was probably founded following the campaigns of Sextus Julius Frontinus in AD 75, and it has been estimated that it originally occupied an area of 1.75 ha. Occupation until AD 110 is probable and there is evidence of a slighting of the defences, a systematic programme of demolition and salvage, and a final clearance of the site by burning (James 1992, 8-14). It may be considered surprising that a coastal road leading southeast to link with Loughor and Neath has not been discovered. It is however possible no such route existed, and that communication by land with the fortress at Caerleon was via the road running through Llandovery, Brecon and Abergavenny. If this was the case, the importance of water transport to Carmarthen cannot be overestimated. During the late 3rd / early 4th century coastal defence work involving the reoccupation of the forts at Loughor and Neath was being carried out, and at this time the position of Carmarthen would have made it ideal as a base for a naval force.

Droitwich (SO 3892630) – *Salinae*

Mid 1st/early 2nd century auxiliary fort (2 ha.)

Drotwich lies on the River Salwarpe, not far from its junction with the Severn, and Roman roads from Metchley, Gloucester, Alcester and possibly Wroxeter met here. At least two places with the name *Salinae* are mentioned in the Ravenna Cosmography (106.31, 46), one is usually attributed to Middlewich in Cheshire. Salt was a product of considerable economic value in the Roman Empire, and its extraction was often carried out under Imperial control. This probably led to the decision to place a fort in a commanding position at Dodderhill, overlooking the river valley and close to the main road junction, and therefore in an ideal position to supervise the local labour engaged in the industrial process. Two parallel ditches have been found, enclosing an area of approximately 2 ha., together with pottery, coin, brooches and military equipment dating from the Claudio-Neronian period. There is evidence of two periods of internal timber building construction, the first indicating a cessation of occupation by AD 70, but a probable revival of imperial interest in the production of salt led to a second occupation from AD 120-50. The brine springs were used in the Iron Age, and it was probably this industrial basis that led to the foundation and growth of the later Roman town.

<u>**Llandovery (SN 770352)**</u>

<u>Mid 1st/mid 2nd century auxiliary fort</u>

The pre-Flavian fort lies at an important crossroads, with a southwest/northeast road leading from Carmarthen to Caerau, Castell Collen and eventually to Caersws, and a southwest/northwest road leading from Brecon via Llandovery to Pumpsaint and then Llanio. The early timber buildings were destroyed by fire at some time, and later rebuilt in the same materials. A third phase involved the addition of a stone revetment and the building of some internal stone buildings, with a final phase, probably c. AD 120-5, being the construction of an internal ditch and rampart resulting in a reduction in size. There is no firm indication of occupation beyond about AD 160 but, in common with Bryn y Gefeiliau and Gelligaer, there is some slight evidence for some form of occupation in the 3rd/4th centuries (Davies 2000, 29).

<u>**Llandeilo (SN 620225)**</u>

<u>Mid/ late 1st century sucessive forts (earliest c. 3.9 ha – later 1.54 ha.)</u>

At Llandeilo on the Afon Tywi there is a "Quay Street" and an oral tradition of ships (barges?) unloading cargo there. Recent excavations have produced Black Burnished pottery and Dressel 20 amphoras (Hopkins 2001, *pers. com.*). Most recently, two superimposed forts have been recorded, during a geophysical survey at Dinefwr Park, Llandeilo. The larger first fort was possibly constructed in the pre-Flavian period, with a smaller fort being built at some later date. Four 1st century silver *denarii* have been recorded, one of Augustus and possibly two of Vespasian. There is evidence of a vicus lining the road leading to the fort at Llandovery (Hughes 2003, 144-7; British Archaeology, September 2003, Davies 2000, 15).

<u>**Pennal (SH 705001)**</u>

<u>Late 1st/mid 2nd century auxiliary fort (1.7 ha.)</u>

The fort at Pennal effectively illustrates the problems of land transport, and the advantages of sea communications. Located on low spur 415 m to the north of the Afon Dyfi, at this point tidal, the fort commands the first good river crossing above the estuary some 15 km to the west. The mouth of the estuary is now less than 1 km wide, having been reduced from an earlier width of 7 km by the growth of the Borth Sands, a bar deposited since Roman times. This view is supported by the positioning of a small fortlet at Erglodd (ST 653905), on a hillside now separated from the river by 4 km of marshland, but the topography suggests that in Roman times it was located on a sheltered bay on the south side of the estuary. The mountainous road running westerly to Caersws is indicated by the short stretch of road running through the small fortlet at Pen-y-Crocbren. The course of the road running south to Erglodd, Trawscoed and Llanio is still conjectural, but the routing to Brithdir where the road continued north to Tomen-y-Mur and branched northwest to Caer Gai and Llanfor, presents even more problems. Pennal is on the south side of the Cader Idris Massif that reaches a height of 893 m, and both the modern A470 via the Dyfi Valley, and the more direct, but even more precipitous A487, would have presented very severe difficulties for any form of Roman wheeled transport, and it is probable that there was no alternative to a much longer coastal road, as followed by the modern A493. A fluxgate gradiometer survey in 2000 (Gwyedd Archaeological Trust, D Hopewell), indicated a ribbon development, extending to over 200 m beyond the ramparts, along two of the roads from the fort. A bathhouse, *mansio*, parade-ground, and a possible circular tomb have been identified, together with the usual range of buildings associated with a *vicus*.

Pen Llwyn (SN 650806)

Late 1st/early 2nd century auxiliary fort (2.8 ha.)

The fort is situated close to the village of Capel Bangor, on a spur overlooking the Afon Rheidol, at a point 8.5 km from the sea. The fort is 6 km above the present tidal level, but extensive engineering works in Aberystwyth have clearly reduced the point to which the tide flowed in Roman times. The course of the road linking Trawscoed to the south, and Pennal to the north has not been established, but such a road must have existed, and a road to the west leading to the fort at Cae Gaer must also be a possibility. Only limited excavation has taken place, but evidence from pottery suggests a brief occupation during the Flavian-Hadrianic period (*Britannia* 9 1978, 408).

Pen-y-Gaer (SO 169219)

Late 1st/early 2nd century auxiliary fort (1.5 ha.)

This fort stands on a detached knoll in the valley of the Rhiangoll, where the road from Abergavenny to Brecon, previously following the valley of the Usk, was diverted to the north of Myarth in order to avoid the confines of the steep-sided valley in the area of Llangynidr. It is probable that the fort was constructed during the campaigns of Sextus Julius Frontinus c. AD 75 and was clearly intended to control the most westerly route through the Black Mountains, therefore dividing contact between Silurian territory to the north and south of the Usk. There appear to have been three phases of construction, firstly a rampart and ditch followed by the raising of the rampart and construction of a stone wall, with a final rebuilding involving dismantling the wall and reconstruction of a replacement to further increase the height of the rampart. The lack of stratified pottery means that there is inadequate evidence to date the two re-buildings in stone, or the final abandonment of the fort, however, that is unlikely to be later than AD 130.

Stretton Grandison (SO636431)

Late 1st/?????? century auxiliary fort (2.2 ha.)

A 1st century auxiliary fort was located to the south of the River Frome, a tributary of the River Wye. Aerial photography has shown an oblong enclosure indicating the walls of a small Roman town, lying to the east of the military road from Gloucester where it crosses the River Frome, and close to an east-west road linking Worcester and Kenchester. A possible local market and service centre is indicated by the find of a steelyard and quantity of iron slag (Buteaux 1966, 1-9).

Tomen-y-Mur (SH 707388)

Late 1st/mid 2nd century auxiliary fort (1.7 ha.)

The fort at is located on the southern flank of the Vale of Ffestiniog, at a height of 275 m above sea level, 4.5 km distant from the tidal Afon Dwryd. Clearly any approach by road would involve the negotiation of steep gradients, but the site commands extensive views to the south, west and north, and this is the probable reason for the siting on such an exposed position. A road runs north to Bryn-y-Gefeiliau and Caerhun, and south to Brithdir and Pennal. A road from the supply base at Caer Gai joins the north/south road, leads west to Pen Llyn and then north to Caernarfon. The remains of an abutment that carried the Caer Gai road from the southeast gate to a timber bridge over a stream are still visible. The size of the fort as originally constructed suggests a garrison of a *cohors quingenaria equitata*, but at some stage, probably Hadrianatic, the fort was reduced in size to 1.34 ha, indicating a conversion to a smaller garrison of a *cohors quingenaria peditata* and the fort was abandoned c. AD 140.

Trawscoed (SN 671727)

Late 1st/early 2nd century large auxilliary (possibly cavalry) fort (3.8 ha.)

The fort at Trawscoed lies on the northern bank of the Afon Ystwth (*Estuctia Fluvis*), 12 km from the sea at Aberystwyth. A sandbar now obstructs the Ystwyth estuary and an artificial breakwater now protects the harbour at Aberystwyth, and it is therefore not possible to determine the tidal extent of the river during Roman times. To the northeast of the fort, a 2.5 km stretch of the river appears to have been artificially straightened, and, as there is no suggestion of medieval or later navigation, it is possible that this took place in Roman times. The course of a road running south to Llanio has been established, but no traces have yet been found of a road running north to Pen-llyn, Erglodd and Pennal. However, these forts are accessible by sea and river, and it must be a possibility that the main method of communication was by water transport. The fort is large enough for a regiment of 1000 infantry, or of 500 cavalry (Manning 1969, 113-6).

Aerial photography established the presence of a substantial vicus to the north east of the fort. A street extending the *via principalis* was 11 m wide and another parallel to it was 9.5 m in width, both being flanked by timber buildings, some with long axes parallel with the rampart, and extending to within 1 m of the ditch. At least two phases of construction were identified, with the first commencing c. AD 75, at some time the buildings were demolished and a deposit of metalling layed over the area as far as the ditch of the fort. The second phase of occupation is extended further northeast from the fort, but it appears that the site was levelled with clay in c. AD 120 and there is nothing to indicate occupation after that date (*Britannia* XVI 1985, 255; 1986, 367; 1987, 278 and 1988, 420).

Forts with evidence of occupation after the mid 2nd century

Brecon Gaer (SO 002297) – *Cicucium*

Late 1st/mid 4th century auxiliary (cavalry) fort (3.14 ha.)

One of the most important forts in Wales was the large 3.14 ha. fort at Y Gaer, 5km west of Brecon. It is located 150m to the north of the River Usk, close to its subsidiary the Yscir and is possibly the *CICIVM* of the Ravenna Cosmography (Richmond & Crawford 1949, 6, 17, 28). The fort lies close to the east-west road from Caerleon to Llandovery and thence to Carmarthen and west Wales. A further road leads to Neath to the southwest, and northeast to Clyro, Clifford and Kenchester. The falls on the river near Llangynidr would have prevented direct access by river, and a portage would have been needed. The fort was founded c. AD 75 - 80 and a tombstone shows that an early garrison was a 500 strong unit of cavalry, the *ala Hispanorum Vettonum civium Romanorum.* The defences and principle buildings were rebuilt in stone at some time during the middle of the 2nd century, with the barracks remaining in wood. A small internal bath building suggests probable reoccupation by a small holding-force in the 3rd century and in the final phase occupation, probably in the late 4th century, this building was converted to living quarters. There is evidence of a substantial civilian settlement on both sides of the road, leading from the North gate for a distance of some 300 m. One stone building may have been a *mansio,* a second stone built building was probably a workshop, but most of the other buildings were of timber construction (Jarrett 1969, 48 – 51).

Caer Gybi (SH 247826)

Late Roman (3rd/late4th century) Fortified harbour

The fort is located on a low 5 m cliff in the modern Inner Harbour at Holyhead on Anglesey. The north and south walls of the fort ran down to the low-water mark, allowing boats to be beached on the shore. At the points where the walls cross the cliffs, and at both inland corners, there are round towers some 5 m in diameter. The positioning and style of building of Caer Gybi is similar to the group of coastal fortifications of the 3rd and 4th centuries, known as the Saxon Shore Forts, and whilst no similar example of a three-sided landing place is known in Britain, there are others on the Rhine frontier, such as Engers and Zullestein, dated to the reign of Valentinian (Putnam 1969, 135-7). A mile to the north-west is a watch tower, clearly intended to give warning of approaching, presumably hostile, vessels. Coins recovered from the interior date to the 390s AD, indicating contemporaneity with the later occupation of *Segontium* (Brulet 1991, 158-61).

Caerhun (SH 775704) – *Canovium*

Late 1st/late 3rd century auxiliary fort (1.97 ha.)

Caerhun (*Canovium)* is situated 5km from the mouth of the Afon Conwy at a point that is tidal and accessible to vessels of up to an estimated 100 tons burden (Casey 1969, 56). The fort is situated at the crossing of the Conwy by the main the east-west road linking Chester with the major fort at Carmarthen, 32 km to the west. There is no known fort between Caerhun and Chester, a distance of 63 km, but the fort at Prestatyn on the coast may have controlled the valley of the River Clwyd and the junction with the road leading south to Ruthin. A mountainous road to the south leads to Bryn-y-Gefeiliau and Tomen-y-Mur, and probably continued via the coastal forts as far south as Carmarthen. A small annex of 0.23 ha. attached to the southern side, with a bath building located between the fort and the river. In addition to the usual range of internal buildings it is possible that two long buildings were stable blocks, indicating that the fort was intended to house a 500 strong composite force of infantry and cavalry - a *cohors quingenaria equitata.* Jones (1984, 79) points out that the *vicus* lay 200 m to the north of the fort and suggests that the open space may have been used as a market place, for stalls or the penning of animals. A possible Roman dock was excavated but without conclusive proof of dating, however the excavator considers that "on the whole, the balance of probability may be said to be in favour of the Roman origin of both the dock and the road leading to it" (Reynolds 1930, 100/1). Building materials were brought in by sea, as demonstrated by the sandstone column from Bodysgallen, near Llandudno, a sandstone base originating from Runcorn in Cheshire, and a plinth from the angle of the West Gate identified as having been quarried at Tattenhall, also in Cheshire.

Coins date the occupation from the Flavian to the Theodosian periods, with a peak occurring in the late third century, this pattern also being observed at several other Welsh forts including Brecon Gaer, Castell Collen and the legionary base at Caerleon. This pattern indicates an intensification of occupation, or perhaps a reoccupation, possibly as a reaction to the threat posed by Irish raiders (Davies 2000, 31).

Caernarfon (SH 485625) – *Segontium*

Late 1st/early 5th century auxiliary (probable part cavalry) fort (2.27 ha.)

The 2.27 ha. fort played a major role in the military control and civilian administration of northwest Wales and is identified in the Ravenna Cosmography as *Segontium*. Located on the tidal mouth of the Afon Seiont, the fort guarded access to the Menai Straits and the Isle of Anglesey, and though no evidence has been located, it is probable that a road ran due south to the otherwise isolated fort at Pen Lystyn, and from there to Tomen-y-Mur and the forts of the west coast. Established in AD 77 on the final conquest of the Ordovices by Agricola (*Tac.Ag* 18), with a coin of the Emperor Theodosius 1st (AD 379-95) demonstrating that the fort remained in use until the end of the 4th century. The continued occupation over such a long period is attributable not only to the strategically important position, but also to the mineral wealth of the area, important silver-lead ores being found in Flintshire, and copper ore being mined on Anglesey and the Ormes. A courtyard house of 2nd century origin and a small bathhouse situated within an enclosed area to the west of the *Via Praetoria* has been interpreted as the residence of an official in charge of mineral extraction for the surrounding region. As the fortress at Chester is some 100 km distant by road, it is probable that civilian administration of the area was also centred on *Segontium.*

The *praetorium,* granaries and barrack blocks were constructed from Cheshire sandstone, and bricks and tiles from the legionary works-depot at Holt on the River Dee were used in quantity. The size of the fort (2.27 ha.) suggests that it was originally intended to accommodate one of the larger types of auxiliary regiment and the presence of a third granary suggests that this was a *cohors milliaria equitata,* a 1000 strong unit consisting of both infantry and cavalry. However, an inscription shows that repairs to the aqueduct in AD 200 were carried out by the 1st Cohort of Sunici, a 500 strong infantry regiment originally recruited from Germany, and this reduction in the size of the garrison led (as at Brecon Gaer) to an internal bathhouse being inserted. A rectangular enclosure measuring 70 by 15 m with walls 1.8 m thick, and in places still standing to a height of 5.8 m, lies about 140 m to the west of the fort at the mouth of the Afon Seiont. Known as Hen Waliau ("Old Walls"), it was originally interpreted as a late Roman fort, but details in construction of the wall in resemble those of the fort proper, having the same round scaffold holes. It is therefore likely to be of the same date as the fort wall, and is best regarded as a large military stores compound (Boon 1969, 59-64).

Caersws

Caersws I (SO 041926) mid 1st century auxiliary (cavalry) fort (3.8 ha.).

Caersws II (SO 029920) late 1st/early 4th century auxiliary (cavalry) fort (3.1 ha.)

Caersws I is situated 1.1 km due east of the modern village, was first noted by St Joseph from air photographs, and is almost certainly a pre-Flavian foundation. Located on a spur overlooking the Severn, the fort does not occupy a commanding position, and is liable to flooding, with better tactical positions nearby on higher ground. The later Caersws II fort (SO 029920) formed the pivot of the road system controlling central Wales, and roads to Pennal, Forden Gaer, Caer Gai and Castell Collen converged on the site, whose possible Roman name was *Mediolanum.* The site is a natural communication centre for the upper Severn Valley and its importance is reflected by its size of 7.6 ha., which places it among the largest of the Welsh forts, together with Forden Gaer and Brecon Gaer. There appear to have been several phases of occupation, the first fort being defended by a clay rampart with all buildings of timber construction, accompanied by possible pre-Flavian pottery. At some time later in the 1st century, the buildings were demolished and the rampart slighted, and it is probable that a break in occupation took place at this time. The buildings of the second fort were also of timber, within a heightened rampart and with a more spacious layout, perhaps implying a change in the composition of the garrison from an *ala quingenaria* to a *cohors quingenaria peditata*. In the Hadrianatic-Antonine period, the fort was completely rebuilt within a stone-faced rampart, and while the barrack blocks were again of timber, the central buildings were built from a sandstone that outcrops 20 km down river, and transport by water must therefore be a strong probability (Britnell 1999, per. com.). 3rd and 4th century pottery has been found (*Britannia* 22, 224-5), and excavation in 1854-5 revealed part of what was almost certainly a fort bathhouse but "as neither plan nor description of the remains is intelligible .... further identification is rash" (Jarrett 1969, 169). A stamped tile with the letters *CICF* (C*(ohors) I C(eltiberorum* or C*(ornoviorum) F(ecit)*) indicates that the garrison at some time was the 1st Cohort of Celtiberi (or Cornovii) (Jones 1969, 66-70). Recent rescue excavations at the *vicus* (Britnell 1989) have revealed a large range of buildings, including 5 bread ovens and a continued existence into the 4th century.

Cardiff (SO 180765)

Mid 1st/late 3rd auxiliary fort

Late 3rd/late 4th century "Saxon Shore" type fort (3.50 ha.)

Finds from the area suggest a succession of forts on approximately the same site, and Wilson (2002, 354-5) suggests that the first was probably a vexillation fortress (c. AD 55), with evidence of pre-Flavian pottery and copies of Claudian *asses*, followed by a conventional fort of the Flavian period, with a further construction early in the 2nd century. A Saxon Shore type fort was built in the late 3rd century, probably under Carausius in the AD 280s, and was occupied until the time of Valentinian (AD 364-78). It is likely that the fort served as headquarters for naval units operating in the Bristol Channel, with detachments being based at re-occupied forts at Neath (*Nidum*) and Loughor (*Leucarum*), and probably at the *civitas capital* of Carmarthen (*Moridunum*). Excavations within the walls have not revealed any substantial buildings and it is probable that the garrison lived in wooden hutments - a similar situation has been observed at the Saxon Shore forts at Richborough and Portchester.

A reconstruction of part of the fort at Cardiff Castle was carried out at the expense of the Marquis of Bute at the end of the 19th century, and is closely similar to the Saxon Shore forts of southeast England. The reconstruction illustrates the semi-octagonal towers and two single-arched gates, each protected by guard towers, however although the gate towers are probably constructed to approximately the correct height, the adjacent curtain wall is certainly too high and its crenellations are more likely to have been level with the first floor windows in the gate towers (Wilson 2001, 354-5).

Forden Gaer (SO 208989) - *Lavobrinta*

Late 1st/ late 4th century auxiliary (cavalry) fort (3.11 ha.)

The fort at lies on a slight rise on the east bank of the Severn, at the point at which the River Camlad joins it, on the line of the road connecting Caersws and Wroxeter. On the evidence of Samian pottery, the occupation at Forden Gaer began in the mid-Flavian, and the defences enclose an area of 3.1 ha., suggesting a garrison of 500 cavalry (*ala quingenera)*. Although the site was occupied into the 4th century, there is nothing to suggest that Forden Gaer was ever provided with stone defences. The site has been very badly damaged by ploughing, and little excavation has been undertaken in the interior of the fort. None of the principal buildings have been examined in detail, although a single block of dressed sandstone suggests that the internal buildings were of stone. At some period in the 3rd century dismantling took place in the interior, and the fort may have been briefly abandoned. A refurbishing of the rampart, and the relaying of the major interior roads seems to have taken place during the second half of the 4th century, dated by a coin of Valentinian 1 of the period AD 364-78 (Casey 1969, 85-88). Limited excavation in 1987 indicated a series of side roads and a possible aisled building in the *vicus* area (Blockley 1988, 417). The combination of a long period of occupation, the absence of stone walls (common on most forts in the later period) and an extensive extra-mural area, might point to something more than just a military function. There is, after all, no civilian administrative centre closer than Wroxeter; proximity to the mineral extractive areas might also suggest some form of pseudo-civilian form of control of resources and taxation.

Leintwardine (SO 404742)

Jay lane (SO 400746) Mid 1st century auxiliary fort (1.97 ha.)

Buckton (SO 390733) late 1st century/late 4th century (part cavalry) auxiliary fort (2.25 ha.)

The River Teme is a major tributary of the Severn, and two forts and the Roman small town of *Branogenium* (shown as *Bravorium* on the Ordnance Survey map of Roman Britain, 5th edition) are located near the village of Leintwardine on sloping ground rising from the junction of the rivers Teme and Clun. The watercourses of these rivers have shown a great deal of change in the last century, and a complex of former channels has been identified (Dinn 1990 4, fig.4). Leintwardine occupied a site of strategic importance as it lay on Watling Street, controlled the Teme valley leading into mid-Wales, was equidistant (37 km) from the crossings of the Wye at Hereford and the Severn at Wroxeter, and was 83 km from Caerleon and 92 km from Chester. An early fort with an area of 1.97 ha. is known at Jay Lane (SO 400746), but there has been only limited excavation, and nothing is known of the internal buildings. At some time the Jay Lane site was abandoned and a 2.25 ha. fort, defended by a ditch, turf rampart, palisade and timber gates and towers was constructed at Buckton (SO 390733). At about AD 120 a stone revetment was set into the rampart, stone gateways and towers were constructed, and stone buildings were erected in the central administrative area. The size of the fort suggests a probable garrison of either an *ala quingenaria* or a *cohors* *milliaria peditata.* Perhaps surprisingly, occupation continued into the late 4th century, as the area had been under Roman control since the earlier period of the conquest.

Loughor (SS 565979) - *Leucarum*

Late 1st/ early 4th century auxiliary (infantry/cavalry) fort (2.15 ha.), (later reduced to1.66 ha.)

Loughor is located towards the west end of a gravel spur on the east bank of the tidal Afon Llwchwr (River Loughor), where the river enters the Burry Inlet to the Bristol Channel, and at a point where the width of the river is less than 200 m. Excavation took place between February 1985 and August 1988, and was one of the most comprehensive investigations of an auxiliary fort in Wales in recent years, being well published in 1997 (Marvell & Owen-John 1997). In particular, the demonstration of frequent changes of garrison, and consequent re-building, is of major interest. The fort possessed a sheltered anchorage and controlled the lowest crossing of the river and, as the river widens out significantly to the north of Loughor, the next feasible crossing-point is some 8 km upstream at Hendy. The only known road from the fort runs towards Neath (*Nidum*), following the line of the modern A 470 to Swansea, but it is probable that a road ran northeast along the eastern bank of the River Loughor to the next crossing point, and perhaps from there continued northwards to Llandeilo to link with the main Brecon (*Gobannium*) to Carmarthen (*Moridunum*) road. It would be surprising if a road did not lead to the west from the river crossing, and a road running in the direction of Loughor can be traced for some distance from Carmarthen. No epigraphic evidence has been found to indicate the garrison of the fort, but it seems probable that it was occupied by a variety of units, as at some times not all available space was utilised, but on others, it was necessary to build additional accommodation. Based on the size of the fort and the fact that horse accoutrements were found, the excavators (*ibid.* 220-222) suggest an initial garrison of a *cohors equitata quingenaria* (a mixed cavalry/infantry regiment of 500 men), but that the garrison of the reduced fort of the 2nd century was an infantry unit of similar size (cohors *peditata quingenaria*). Limestone, Millstone Grit and Pennant Sandstone were widely used throughout the fort and were locally available, as was sand for mortar and cobbles and gravel for the roads and foundations. Marvell and Owen-John point out (*ibid.* 223) that, whilst not necessarily using prefabricated timbers, an excavated granary was clearly built to a given design, and draw attention to the suggestion that these structures were supplied in the pre-fabricated form (Richmond & McIntyre 1939, 151) and also that Hobley (1982, 271) has argued that this method could also applied to gateways. As both types of structure could be quickly erected and provide effective protection to fort entrances, safe storage of supplies and particularly as they could also be easily transported by sea, there is considerable merit in the suggestion that this may have applied to many other forts in the study area. The excavators comment (*ibid.* 226) that construction was "no doubt carried by staff of *legio II Augusta*" has less to commend it as, from the records of the Vindolanda tablets, it is now realised that a full range of constructional skills existed within the ranks of an auxiliary unit.

The fort was established during the early years (AD 73-4) of the governorship of Sextus Julius Frontinus, and formed part of a network of forts and roads controlling the main routes through the South Wales uplands and coastal plain. There is archaeological evidence that the fort was fully garrisoned until c. AD 85, but that this was followed by a apparent downgrading of the fort with a significant reduction in the numbers of troops, and even a possible brief period of abandonment, probably coincident with the withdrawal from Britain of *legio II Adiutrix* in 86/7 to deal with problems on the Danube frontier. The return of a full garrison in the earliest years of the 2nd century is marked by a major re-furbishment of the fort, including the construction of a bath-house and a new *praetorium*. At some time between c. AD 105-110, and probably indicating a change of garrison, further construction took place including the building of a new praetorium. At some time before AD 120 another change of garrison appears to have taken place, with all the major roads being resurfaced, some conversion of existing buildings and yet another new *praetorium* being built. Whilst the excavators point out that precise dating is difficult, at some time between c. AD 115 and 130 the fort was reduced to approximately two-thirds of its original size, by the construction of new western defences comprising a ditch with clay and turf rampart, accompanied by the filling in of the original fort ditch. However, the fort appears to have fallen into disuse before construction of the interior buildings had been completed. There is the probability of a brief period of reoccupation in the mid-2nd century, as was also the case at nearby Neath (*Nidum*). A further reoccupation, with the construction of a stone wall on the crest of the rampart, accompanied by limited rebuilding within the reduced fort, took place in the late 3rd century with the latest evidence for occupation being a coin of Constantine II as Caesar (AD 324-330). Again, it is the probable that similar activity took place at Neath in the same period and that both forts, controlled from the newly-built Saxon Shore type fort at Cardiff, formed part of a system of coastal defence along the Bristol Channel (*ibid.* 206-229).

Neath (SS748977) - *Nidum*

Late 1st/late 2nd century (with late 3rd/early 4th century re-occupation) auxiliary fort (2.4 ha.)

The fort has been identified with the *Nidum* of the Antonine Itinerary, and lies on a low plateau of the western bank of the tidal River Nid, controlling access to the Nid Valley, which penetrates deeply into the hills. Early Flavian Samian and coarse ware recovered from the fort are consistent with foundation during the governorship of Sextus Julius Frontinus (Heywood 1969, 98-101). Overlooking the crossing of the trunk road from Caerleon to west Wales it was easily accessible by land and sea, and was one of the most strategically important forts in South Wales. A road ran northwest to Coelbren and then Brecon Gaer, a milestone of Diocletian (284-305), was found some 2.5 km south of the fort, and probably marks the line of the major road running east to Cardiff and Caerleon, and west to Loughor and Carmarthen. Intermissions of occupation are indicated by an accumulation of silt and loamy soil containing many potsherds and other rubbish (Marvell & Heywood 1992, 179). The history of this site is complicated with initial construction and occupation dating from AD 80/90. At some time rebuilding took place, and the site was occupied until c. AD 110/115, followed by a short period of abandonment and then reoccupation from about AD 117 to 125. The fort was again abandoned from about AD 125 to 140, with a second re-occupation lasting from AD 140 to 170. There is evidence for late 3rd/early 4th century re-occupation, with all excavated sites producing some evidence of Roman activity during this period, and a military presence is the most likely explanation. It has been suggested that this is more likely to be connected with the usurpation of Carausius, and subsequently Allectus, rather than the protection of the coast by a system of coastal defence from Irish raiders (Marvell and Heywood 1992, 288-92).

Pentrehyling (SO 245931)

Late 1st/mid 4th century auxiliary fort (2.5 ha.)

The 2.5 ha. fort at Pentrehyling near Brompton is thought to be a Flavian foundation, with a long period of occupation, as the ditch was re-cut in the early 4th century (Allen 1991, 246-50). Bowl furnaces and clay hearths with charcoal and furnace debris, together with pits containing considerable quantities of litharge from cupellation; indicate industrial activity within the fort itself. To the east of the fort, the *vicus* contained a dense concentration of industrial pits and gullies, yielding iron-smithing slags, hearth bottom material and lead waste. This leads to the conclusion that the fort was a processing plant for the ore obtained from nearby Linley (*Britannia 22* 1991, 246-50).

Cities and towns

The study area displays the range of Romano-British urban settlement, with a *colonia* at Gloucester, *civitas capitals* at Wroxeter, Carmarthen and Caerwent, small towns at Worcester, Droitwich, Cowbridge, Kenchester, Leintwardine, Blackwardine, Sea Mills, Charterhouse, Weston under Penyard, Abergavenny and Monmouth

Cities

Caerwent (ST 489905) - *Venta Silurum*

This present small village is 3.2 km from the Bristol Channel lying on the Roman main road from running from Gloucester (*Glevum*), to Caerleon (*Isca*) and beyond. Known as *Venta Silurum* (Market of the Silures) in Romano-British times, it was mentioned in both the Antonine Itinery and the Ravenna Cosmography. It became the administrative centre and tribal capital (*civitas*) of the Silures, whose territories included the modern counties of Brecknock, the Glamorgans and Gwent. It required a period of some 30 years hard campaigning to conquer the Silures, and in 50 the Roman army suffered its greatest defeat in Britain at their hands, when it lost a large part of a legion in a battle with the tribe. However, Caerwent was located in an area that had been under Roman control since the mid AD 50s, some twenty years before the rest of South Wales. The presence of a *forum-basilica* in a town is indicative of self-governing status, excavations have indicated that the erection of these buildings took place at Caerwent at the time of Hadrian (AD 117-38), and it is supposed that *civitas* status was conferred at that time.

Venta Silurum covered an area of some 18 ha., with a planned grid system of streets that divided the town into 20 rectangular plots (*insulae)* containing the public buildings, private houses and shops. In addition to the *forum-basilica* there were two temples, a public bathhouse and a *mansio.* Wooden water-pipes running southwards from the north gate, and a large drain under the south gate, indicate that the town had its own fresh water supply, channeled by an aqueduct from the hills to the north. A large elliptical enclosure was originally identified as an amphitheatre, but is now thought more likely to have served as a livestock market (Brewer 1993, 14-23). It is probable that Caerwent did not acquire defences until late in the 2nd century, these comprised a ditch, earthen rampart, wooden palisade and timber gatehouses. Probably around AD 330 a stone wall was built in front of the rampart, stone gate-towers were added and a number of bastions were added to the south and north walls, with a coin hoard, found in builders' debris, indicating that the towers were constructed at about AD 349-50.

Caerwent clearly enjoyed a significant period of prosperity during the 4th century, with the building of elaborate and well-constructed new houses with lavish decorations, and alterations, including the laying of mosaic floors, carried out to existing dwellings. This period coincided with the menace of sea-borne raiders from Ireland, using the Bristol Channel and Severn Estuary to plunder the rich hinterland of the Cotswolds. Late military equipment has been found at Caerwent, including two *plumbatae* (lead weighted darts characteristic of the 4th century), military belts and buckles, and crossbow brooches usually associated with military uniforms and, given that the legionary fortress at Caerleon had been virtually abandoned by that time, it is probable that there was some form of military presence was in the town at this time. Although there is no evidence that Caerwent itself was ever attacked, the town began to run down by the late 4th century with buildings being abandoned. Some form of occupation continued into the 5th century, but by that time most of the town was in a ruinous state (Brewer 1993, 28-32).

There has been a persistent local tradition that Roman ships were able to reach Caerwent via the Nedern Brook, and that mooring rings, enabling vessels to tie up to the walls, were in existence until modern times. However, Waite has convincingly argued (1990, 13-22) that this could not have been the case, and that the landing place was at Black Rock, near to Sudbrook, where a Roman garrison was installed within the ramparts of the Iron Age fort (Nash-Williams 1939, 42-79), presumably to control a ferry crossing of the Severn Estuary, and this is further discussed in Chapter 6.

Carmarthen (SN 416214) - *Moridunum Demetarum*

Identified from the Antonine Itinerary as *Moridunum*, an early fort was succeeded by the *civitas capital* of the *Demetae*. The city lay on the tidal estuary of the Afon Tywi (*Tuvius Fluvis*), 15 km from the sea, and beneath the modern town. Roads leading east along the valley of the Twyi to Llandovery, and northeast across hilly terrain to Llanio, have been identified. A road leading westwards towards the coast has been traced over a distance of 42 km, and almost certainly led to a coastal fort or forts, whose sites have yet to be discovered. There is only limited evidence of pre-Flavian military action in southwest Wales and it has therefore been argued that, in contrast to the *Silures*, the *Demetae* were rather more peaceable, or actively pro-Roman, than their neighbours. It is possible that this led to the granting of self-government and the establishment of *Moridunum Demetarum* as the *civitas* capital of the tribe. The excavation of the *forum* and *basilica* in several *civitas* capitals of Roman Britain provides the physical evidence of administrative status but in Carmarthen, if such remains existed, they lie buried under the modern town. It is clear that by AD 150 the town had a planned and regular street layout, even if not strictly conforming to the rectangular *insulae* layout seen at Caerwent, and this may coincide with the designation as a *civitas* capital.

A bathhouse and a possible *mansio* have been identified on the southern side of the town, and the streets were lined with a crowded pattern of rectangular timber workshops, shops and houses. A typical Romano-British temple, similar to that found near the forum at Caerwent, was built during the late 1st century but demolished before the end of the 2nd century. Cutting back into the hillside and using the excavated soil and rock to form the outer seating bank enabled the construction of a theatre/amphitheatre, lying to the north of the defences. The structure had overall dimensions of 91 m by 67 m, which Wacher points out (1995, 389-393), is significantly greater than that at the much larger *civitas* capital of Cirencester, where the amphitheatre measures 49 m by 41m. He suggests that it may therefore have been intended as a gathering ground for a large part of the Demetic tribe, and considers this as one of the more cogent reasons for considering Carmarthen as a *civitas* capital. Defensive walls were built to enclose an area of some 13 ha., and the use of similar materials and methods of construction appears to indicate that the timber and earth defences around the town were developed during a single period of construction during the late 2nd century. In common with many other towns, Carmarthen was provided with new stone defences at some time in the late 3rd, or perhaps early 4th. century with stone gate-towers along the circuit walls. Late Roman spearheads, shield bosses, crossbow brooches and a belt-stiffener are indicative of some military presence in the town. Continued occupation until the late 4th/early 5th century is indicated by a coin of Honorius (AD 393-5) of the *Salus Reipublicae* type, but from an eastern mint. This is unusual, but the excavator sees no reason to doubt the provenance, as it was found in a late Roman dumped layer (James 1992, 25).

Manning has pointed out that, compared to the much larger cities found elsewhere in Britain, Carmarthen would have seemed very small and provincial, but that as a symbol of Roman success in persuading the native populations to accept their customs and ideas it has more significance. He goes on to suggest that "In an area which was almost devoid of other aspects of Romanisation, it was a beacon of civilization" (2001, 72).

Gloucester (SO 830180) - *Colonia Nervia Glevensium*

In about AD 98 a *colonia* was established on the site of the former fortress of the 2nd Legion, and therefore on land that for some time had been Imperial territory. There was riverine land nearby that could be reclaimed by Roman drainage methods, and which may previously have been of little value. It is therefore probable that the bulk of land redistributed to the colonists had not previously been settled by the local population. This tactic would have avoided the resentment caused half a century earlier, by the appropriation of the best tribal land by the colonists of Colchester (Salway 1993, 108-110).

The official name and date of foundation can be fixed with some accuracy, as a tombstone of a *frumentarius* of the 6th Legion, found in Rome, describes him as being of *Ner(via) Glevi;* suggesting the official name as *Colonia Nervia Glevensium* and the date lying between AD 96-8 during the principate of Nerva. The fortress was converted into a *colonia* by the simple expedient of adapting the barrack blocks into domestic dwellings. Some other buildings in the fortress were retained for civilian use, but others were demolished without immediate replacement. The town was defended by re-using the fortifications of wall, rampart and ditch belonging to the legionary fortress; the north, east and west gates have been identified and are nominally retained in the modern city. During the late 3rd century a programme of refurbishment and replacement of the walls was carried out and projecting towers were added, possibly indicating a quasi-military role at this time.

Situated at the head of the Severn Estuary, the importance as a major port of the legionary fortress, and later *colonia*, at Gloucester may be judged by the significant archaeological evidence of maritime activity. The course of the River Severn changed during, and since the Roman period; this is illustrated in Figure 7.4. Gloucester has produced only limited evidence of early industry within the walls. A pottery kiln and iron working surface have been located, three other 1st century kilns are known from outside the east gate, probably belonging to the legionary period. A brick and tile works, supplying the needs of the developing town, developed due north of the walls and close to the contemporary course of the Severn. Many of its products were stamped with the initials RPG, standing for *Rei Publicae Glevensium* and sometimes included the abbreviated names of the two *duoviri,* traditionally responsible for controlling public works (Heighway & Parker 1982, 25-78). Iron working production seems to have grown in the 3rd and 4th centuries, when slag was used for resurfacing the streets and yards, and a large lime-burning area was located along the London Road, about half a mile from the north gate.

An extensive and prosperous built-up area lay outside the walls, which when added to that within the walls, virtually doubled the total inhabited area of the town to some 50 ha. and the previously held view (e.g. Richmond 1946, 83; Wacher 1975, 155) that Gloucester was a "failed town", with its growth stunted by nearby Cirencester (*Corinium*), is no longer tenable. The most important suburb was outside the north gate, and its origin probably lay in the civilian settlement attached to the fortress. Alongside the roads leading to Kingsholm and Cirencester were timber, and then masonry buildings fronted by colonnades, some of which were associated with commercial use. A monumental structure in this area has been tentatively suggested as the base of a triumphal arch, but it could equally well be the abutment for a bridge carrying the road over a small stream.

Wroxeter (SJ 568088) – *Viroconium Cornovium*

The fortress at Wroxeter was constructed by the 14th Legion in about AD 58, under the governorship of Quintus Veranius, the 20th Legion taking over in AD 69 and being abandoned in c. AD 80. With the removal of the military presence the site was handed over to the civil authorities and, unlike other redundant fortresses such as Colchester, Lincoln and Gloucester that became *coloniae*, was made into an administrative capital *(civitas)* and given a certain amount of local autonomy. The city of *Viroconium Cornoviorum* at Wroxeter grew to be the 4th largest city in Britain in the 2nd century, with a defended area of 90 ha.

The presence of the military for 30 years was long enough for a considerable civilian settlement to have developed. Legionaries would have retired at the rate of about 100 per year and there is a strong probability that some of them, after having lived there for several years, would have married local women and settled in the area. Traders, who would have been attracted by the provision of goods and services for the soldiers and the local population, were located in a civilian settlement under military control, but outside the fortress itself and, by the time the legion finally departed, there would have been a well-established community.

Following the visit of Emperor Hadrian to Britain in 122, the city was much increased in size, and provided with one of the largest and most sophisticated civic centres in the country, with a large *forum-basilica* and extensive public baths. A well-executed inscription of AD130 commemorates the erection of the *forum* (Wacher 1995, 362-377). Following successive periods of growth and decline in the 2nd, 3rd and 4th centuries, a significant resurgence of activity took place after AD 400, at a time when the Roman administration began to withdraw from Britain, and 5th century continuity, of a kind, is now established. The function as a *civitas* capital was probably in decline by the mid-4th century, as shown by the abandonment in disrepair of the baths and basilica complex in c. AD 350. Commercial activity, however, continued long enough for wheeled ruts to have been worn into collapsed columns. In place of upstanding stone buildings, there emerged a remarkable collection of (at times elaborate) timber successors. Rows of timber shops and booths have been identified, some being built as lean-to structures against lengths of surviving walls, and a major timber building occupied most of the nave of the *basilica*. Some postholes at Wroxeter were found to contain sherds of Mediterranean amphoras of 5th century date, but the overall chronology remains uncertain. Remnant magnetic dating of the last firing of a bread oven gave a date of between 490-550 (White & Barker 1998, 121). Although some of the timber buildings at Wroxeter were of a large scale, this should not obscure the apparent overall decline of the site, and it has more of the appearance of a power base for an individual rather than a town. The tombstone of an Irish chieftain is known, perhaps belonging to the early years of the 6th century (Jones and Mattingly 1990, 311-2). It has been suggested that the control of the area was subject to religious, not secular, control and may have been the seat of an early bishopric, as a result of either an Irish importation or local opportunism (White & Barker 1998, 121).

As aerial photography had failed to indicate any sign of buildings in the eastern segment within the defensive walls, Wroxeter had variously been characterised as either a failed town or a garden city. However, recent extensive geophysical survey has shown a density of wooden buildings, extending right up to the walls. It is clear that the overall density of occupation means that the accepted picture of *Viroconium* as an under-populated city is incorrect (White & Barker 1998, 31).

Small Towns

Abergavenny (SO 299140) - *Gobannium*

It is probable that a *vicus* outside the fort may have developed into a small settlement after the closure of the fort (Manning 2001, 74), and the coin series extends well into the 4th century (Davies 1983, 89). The Roman name for Abergavenny was *Gobannium*, and Green (2000, 71) suggests that the key element in the name is *gobban*, which seems to be related to *gof*, smith in modern Welsh. She argues that the name suggests iron working before the establishment of the early fort, and, as smithing has been identified at nearby Usk there is a strong case that this interpretation is correct, and that the Roman settlement developed to exploit this activity. The major consumers of iron products in the area would have been the fortress and *canabae* at Caerleon, but as no iron smelting activity has been detected at the large fort at Y Gaer near Brecon, it is possible that iron products were shipped upriver to that point. Abergavenny would have value as a market centre between the rich arable lands to the east and south., and the pastoral areas to the west and north.

Blackwardine (SO534567)

The small town lies at a height of between 100 m and 120 m on the line of the Roman road from Weston-under-Penyard, but the destination of the route to the north has not been established. The town is situated 2 km to the west of the River Lugg (a tributary of the River Severn) and 3 km upstream from Leominster, to where navigation is known. Artefactual evidence indicates that the Romano-British settlement was established in the later 1st century, and it is probable that the town was provided with defensive walls in the 2nd century. Coin and pottery evidence, together with comparisons with Kenchester, suggest that occupation continued into the 5th century, the latest coin being one of Honorius (AD 393-423). The quality of the archaeological evidence is not sufficient to determine the development or extent of the town, but there is evidence for timber and stone buildings with stone and tile roofs. Evidence for hypocausts, painted wall plaster and mosaic floors, indicate some higher status buildings within the town (Bateaux 1996, 1-11).

Charterhouse (ST 500565) - *Veb.?*

It is probable that the lead mining took place on Mendip before AD 43, but the Romans rapidly exploited the mines around Charterhouse, and a small town, together with a small fortlet, grew up in the area , with the settlement lasting into the 4th century. The earliest ingot from the mines is dated to AD 49, and Mendip ingots of the same period have been recorded in northern France, indicating that lead was being exported to the continent, only six years after the Claudian invasion. It has been suggested that a cistern at Pompeii, buried by the eruption of Vesuvius in AD 79, was made of British lead, probably from Charterhouse. Mendip lead was mined partly for its silver continent of 0.4%, this was extracted by the cuppellation process (Elkington 1976, 183-199, 230-234) and early lead ingot bearing the stamp of the 2nd Legion indicate that the mines were initially under military control. However, a lead pig dated AD 60 is marked "from the lead-silver works of Gaius Nipius Ascanius" making it clear that the control soon passed to private lessees.

A group of ingots (now in Wells Museum) from the reign of Vespasian read BRIT.EX.ARG.VEG., "British lead from the Veb..... lead-silver mines", but the full Roman name of Charterhouse is not known. Excavation in 1994 revealed a number of well-defined ditches or "rakes", where Roman miners had dug out the lead along the natural features and veins. Pottery of the 1st century AD, mostly fine ware, has been found in association with discarded pieces of lead. The last securely datable ingots (in Taunton Museum) was made between AD 164 and 169, but coin finds indicate that occupation of the settlement, and presumably the working of the mines, continuing into the 4th century. Excavation in 1908 on a small Roman amphitheatre revealed significant quantities of Neolithic and early Bronze Age material, and it is possible that (as at Dorchester) a small prehistoric henge was adapted and enlarged to form the structure.

There are three possible routes for the transport of Mendip lead. The road from Charterhouse to the Fosse Way was probably constructed for this reason, as was the road to Chew Park , where cuppellation took place (Rahtz & Greenfield 1977, 17), and from there to the River Avon (Margary 541), giving access to Sea Mills and the Severn Estuary; or via Cheddar Gorge to the River Yeo and then to the Bristol Channel and the Western Seaways.

Cowbridge (SS 995745) - *Bovium*

Cowbridge probably developed in the late 1st century as a "ribbon development", continuing well into the 4th century, with excavations in parts of the modern town revealing workshops and houses fronting the road to west Wales. Finds of a *ballista* bolt, and several other pieces of military equipment, suggest an early fort, but no structural remains have been found to confirm this suggestion. There is evidence for iron working from the 2nd to the 4th centuries, with large quantities of iron slag having been found, but none of the material was found *in situ* and no furnaces or hearths have been identified (Parkhouse 1981b, 309; 1982a, 11).The town probably acted as a market centre for the developing "villa economy" of south Wales and the importance of agriculture is indicated by several kilns for drying corn. A small bathhouse using tiles with the *Legio II Augusta* stamp indicates military involvement, and it is possible that the settlement owed its origins to the establishment of a *mansio* (Manning 2001, 74). The nearby multivallate hillfort of Caer Dynnaf enclosed 4.9 ha. and excavations revealed 1st to 4th century pottery and quern stones, suggesting contemporary occupation with Cowbridge throughout the Roman period.

Droitwich (SO 3892630) - *Salinae*

At least two places with the name *Salinae* are mentioned in the Ravenna Cosmography (106.31 and 46) and one is usually attributed to Middlewich in Cheshire. Rivet and Smith (1979, 120 and 451) consider that the second should be associated with Droitwich on the basis that, despite Ptolomey's placing of one location in the Catuvellaunian territory, his correct estimate of the distance from London and the history of salt production over a long period make Droitwich the most likely contender.

The town lies on the River Salwarpe not far from its junction with the Severn and Roman roads from Metchley, Gloucester, Alcester and possibly Wroxeter met here. The brine springs were used in the Iron Age, and it was probably this industrial basis that led to the foundation and growth of the Roman town. The extraction of minerals was often carried out under Imperial control and a fort was located here, soon after the invasion, on the higher ground to the north at Dodderhill, in an ideal tactical position overlooking the river valley and close to the main road junction. The existence in a number of small towns of buildings of greater extent and more sophisticated plan than the general run, has led to a suggestion of the presence of a *beneficarius* and that this may have been the case at Droitwich (Burnham and Wacher 1990, 38).

The earliest evidence for Droitwich as a centre of salt production comes from the 5th/6th centuries BC, and briquetage, petrologically identified as coming from Droitwich, has been found at several sites distant from the source (Morris 1985, 346). Large quantities of briquetage have been recovered, together with a number of clay-lined pits up to 2.3 m across that were located near brine springs and were probably used as storage or settlement tanks for brine. It appears that a considerable length of the Salwarpe Valley, with evidence occurring as far east as the Hanbury road, was involved in the industrial process and it has been suggested that special ceramic vessels were made in the Malvern potteries, as containers for the salt produced at Droitwich. The production of salt is dealt with in some detail in Chapter 8.

Kenchester (SO440428)

Kenchester is strategically located in the valley of the River Wye, on an important east-west road heading towards the early military bases at Clifford and Clyro. Other roads lead northeast towards Leintwardine and Wroxeter, south across the Wye to Abergavenny and east to Sutton Grandison. This has led to speculation that the town owed its origins to an early military presence, supporting the Roman advances into the Welsh Marches. However, no trace of a fort has been located at or near the later town, and only three isolated pieces of military equipment are known. Evidence for the maritime use of the River Wye includes tile and pottery from Gloucester and Cirencester, Forest of Dean iron ore and quern stones and, most significantly, stone from the Cotswolds used for architectural stonework, including columns of oolitic limestone (Buteaux 1996, 1-16).

The town defences enclosed an area of 10 ha., and, when erected c. AD 150, comprised a rampart and ditch with wooden gateways. In the middle 4th century a stone wall was added to the rampart, and stone gateways and bastions were erected. Prior to the construction of the town defences the settlement was a linear development stretching some 700 m to the east and 400 m to the west of the military crossroads. The economic base was predominantly agricultural, but there is some evidence for iron and copper alloy working. The town underwent a number of internal re-organisations and rebuilding, with a major re-modeling of the town centre occurring in the mid to late 2nd century. This involved the construction of new roads, the provision of drains within the defended area, and the erection of at least one public building (Burnham & Wacher 1990, 70-76). Limited excavation has revealed the existence of a number of high status buildings within the town, including a porticoed house with projecting wings, and a large building with four hypocausts, two mosaics and a bathhouse. Buildings of this type suggest the presence of wealthy individuals living within the town itself, and the number of nearby villas draws attention to similarities with the occupation pattern that has been identified at Cirencester.

It has been suggested that Kenchester acted as a *pagus* centre for the western Dobunnic area, which was isolated from the *civitas* capital at Cirencester by the *territorium* surrounding the *colonia* at Gloucester (Rivet 1964, 152-3; Wilmott 1980, 128). It is also possible that, following the re-modeling of the area enclosed by the new defences in the later 2nd century, the status of the town was raised - possibly by elevation to that of *civitas* capital (Wilmott 1980, 123).

New Weir (SO 436418) lies 1 km south of Kenchester, and 0.5 km west of the line of a Roman road, leading from the east gate towards a postulated crossing over the River Wye. A pair of buttresses, still standing to a height of 4 m, rise from the river to a terrace on which there was a complex of rooms, including at least one with a mosaic pavement. 50 m southeast is a further complex of rooms that were probably joined by a corridor (*Britannia* 27, 418). Downstream is a six-level octagonal stepped cistern which, when found in 1891, contained numerous *tessarae* and is a possible water-shrine or *nymphaeum*. Shoesmith has suggested that, because of the significance of water transport of the River Wye, the site may be the villa of a prosperous merchant engaged in the supply of goods to nearby Kenchester (1977, 196).

Leintwardine (SO 404742) - *Branogenium*

Leintwardine originated as a *vicus* of the nearby fort at Jay Lane, and the civilian settlement lays on both sides of the present High Street, which follows the course of Watling Street West, the major route from Caerleon to Chester. The settlement developed in the 2nd century and a bathhouse, dated to about AD 140, was constructed near the river. After the abandonment of the Jay Lane fort, the settlement remained associated with the new fort at Buckton. The settlement was provided with defences, consisting of a timber-laced rampart with a berm and ditch in the late 2nd century, and was continuously occupied till the mid/late 4th century. Watling Street crossed the Teme immediately south of the town, but it is uncertain whether the river was crossed by a bridge or by a ford (Dalwood 1996, 1-9).

Monmouth (SO 510128) - *Blestium*

Situated on the banks of the River Wye, near its junction with the River Monnow, Monmouth is probably the *Blestium* of the *Antonine Itinery.* Major roads run west to Gloucester (Margary 61) and south-west to Usk and Caerleon (Margary 612B), with a branch road (Margary 612A) leading north-west to the major iron-working settlement at Weston under Penyard (*Ariconium).* Massive deposits of iron working waste lie beneath the present town and on the riverbed of the Wye, and although much of the slag was produced during the medieval period, excavation revealed sealed Roman contexts lying beneath 4 m of iron slag. There is evidence from of iron working on the site from c. AD 75 to the end of the 3rd century, and the quantity of smelting and primary smithing slags suggest that iron working was extensive throughout this period. An intact primary smithing hearth was located, complete with its final charge of fuel, and analysis of coal that had been used for the smithing process, indicated that it had been mined from surface outcrops 1.5 km from the Wye, at Braceland near the Berry Hill area of the Forest of Dean (Walters 1992, 78-9.

Sea Mills (ST760551) - *Abonae*

In common with the majority of Roman forts, a *vicus* developed outside the 1st century fort perimeter, but, unusually, this settlement did not cease to exist after the military garrison had departed. The port facilities and its position on the main road from London to South Wales, would have made it a convenient shipment point for goods and passengers in transit from the south and southeast, as well as a market centre and distribution point for the surrounding countryside. Bennet (1985, 4) has pointed out that owing to the lack of controlled excavation and the standard of the work carried out before 1940 (Ellis 1896; Tratman 1923; Bristol City Museum; Dobson 1937; Dobson & Walker 1939) the subsequent development of the settlement is uncertain. Boon (1945, 258-95) showed that several masonry structures existed, and that some buildings had possessed mosaic floors and decorated wall plaster. At least part of the town had been burnt in Hadrianic period, and it is possible that this led to reconstruction of some of the buildings in stone. Despite its proximity to the Bristol Channel, and unlike Caerwent, Sea Mills does not seem to have possessed defences, but the coin series, terminating with an issue of Arcadiius of 408 (Reece 1966, 218-220), indicates that the settlement was still occupied at that late date.

Weston under Penyard (ST 634235) - Ariconium

The small town of *Ariconium* (Weston under Penyard) was a major centre for iron smelting and forging, and nearby slag tips covered over 80 ha. (this may be compared with the largest example from the Weald which covered 2.8 ha. [Dark 1996, 11]). The site is situated 4 km from the River Wye, and a road leads to Mitcheldean (Margary 611) and then to Gloucester and the River Severn (Margary 61), so supply of military materials such as weapons, and nails for fort construction, to a wide area was possible.

It has been estimated that around 80 furnaces could have been in operation at Ariconium and the other nearby smelting sites, and that a labour force of 400 would have been required to operate them, in addition to the smiths operating the forges (Walters 1992, 75). A number of settlements, e.g. Ruardean, Drybrook, Huntley and Symonds Yat, have produced evidence of smithing, but not of forging, and it is probable that the blooms were supplied to *Ariconium*, for manufacture into iron products.

By contrast to the Weald, where iron was smelted close to the ore sources, in the Forest of Dean smelting sites adjacent to the source of the raw material are extremely rare. Dean ores have been recognised at Worcester (probably to supplement leaner local supplies) and at many the villa sites east of the Severn. Allen & Fulford (1987, 279-81) observed that "our estuary sites, along with Worcester, can be seen as part of a more widespread practice of exporting the ores away from the ore-bearing formations to be smelted elsewhere...... clearly the Severn and the Wye played a major role in the distribution of ore away from the producing area".

In 1989 an excavation 1 km north of the iron working site revealed two small fortlets, each of about 0.2 ha., one overlying the other and therefore not contemporary. Each fortlet could have accommodated a century of soldiers and the excavators concluded that they should be "viewed as modest sized administrative centres, staffed with a minimum of manpower and supervising the production, supply and distribution of artefacts and forgeable iron, to advance military forts west of the Wye" (Walters 1992, 71).

Worcester (SO 385255)

Lying on the River Severn, "Less is known about the small town of Worcester than probably almost any other in Britain." (Burnham and Wacher 1990, 232) and this is illustrated not only by the brevity of their one page reference to it, but also the paucity of Roman exhibits in the City Museum. It seems probable that the town was engaged in the metal industry, on a substantial scale, making use of processed ore from the Forest of Dean. The town was sited on a major road, was on a navigable river with easy access to the Western Seaways, and was therefore able to take advantage of an integrated transport system. It would have supplied a range of services and facilities, not only for a resident population and the neighbouring agricultural community, but also for travellers on the roads and river. There would probably have been periodic or permanent markets, supplying a range of urban goods and services in exchange for agricultural products. The river was possibly fordable, and as yet the existence of a Roman bridge over the river has to be proved, although it seems a reasonable proposition. The tactical importance of the river crossing suggests an early fort and coins of Augustus, Tiberius and Claudius have been found, together with two 1st century ditches that may have been of military origin, but no certain structural evidence has been located. Only small-scale rescue excavations have been carried out, which have provided limited evidence of a possible cemetery near the castle mound, where unbroken glass suggests cremation, rather than inhumation. A 9m diameter circular structure, with associated 3rd and 4th century coins, suggests a temple or shrine, and timber buildings east of the cathedral ran along a street made entirely of iron slag. Two wooden water pipes, with surviving iron junctions, suggest that Worcester possessed an aqueduct with a distribution system. Probably in the 3rd century an iron foundry with at least six smelting hearths was established, and the large quantity of slag used for road surfacing indicates that the processing of ore, brought up river from the Forest of Dean, was a major activity in the town. It is possible that lead from mines near Felindre, over 20 miles above Leintwardine, and iron ore from mines above Ludlow was carried down to forges in the Worcester area in barges. The absence of late period coins indicates probable abandonment in the mid3rd/early 4th century.

Appendix 2. The writings of Tacitus concerning the study area

Annals 12.

32. The Roman army then struck against the Decangi, ravaging their territory and collecting extensive booty. The enemy did not venture upon open engagement and when they tried to ambush the column, suffered for their temerity. Ostorius had nearly reached the sea facing Ireland when a rising by the Brigantes recalled him..........But neither sternness nor leniency prevented the Silures from fighting. To suppress them, a brigade garrison had to be established.

33. Next Ostorius invaded Silurian territory. The natural ferocity of the inhabitants was intensified by their belief in the powers of Caractacus, whose many undefeated battles, and even many victories, had made him pre-eminent among British chieftains. His deficiency in strength was compensated by superior cunning and geographical knowledge. Transferring the war to the country of the Ordovices, he was joined by everyone who found the prospect of the Roman peace alarming. Then Caractacus staked his fate on a battle. He selected a site where numerous factors - notably approaches and escape-routes - helped him and impeded us. On one side there were steep hills. Whenever the gradient was gentler, stones were piled into a kind of rampart. And at his front there was a river without easy crossings. The defences were strongly manned.

34. The British chieftains went round their men, encouraging and heartening them to be unafraid and optimistic, and offering other stimulants to battle. Caractacus, as he hastened to one point and another, stressed that this was the day, this the battle, which would either win back their freedom or enslave them forever. He invoked their ancestors, who by routing Julius Caesar had valorously preserved their present descendants from Roman officials and taxes - and their wives and children from defilement. The exhortations were applauded. Then every man swore by his tribal oath that no enemy weapons would make them yield - and no wounds either. This eagerness this made the Roman commander disconcerted, as he was already by the river barrier, the fortifications supplementing it, the overhanging cliffs, and the ferocious crowds of defenders at every point. But our soldiers shouted for battle, clamouring that courage could overcome everything; and their colonels spoke to the same effect, to encourage them further.

35. After a reconnaissance to detect vulnerable and invulnerable points, Ostorius led his enthusiastic soldiers forward. They crossed the river without difficulty and reached the rampart. But then, in an exchange of missiles, they came off worse in wounds and casualties. However, under of a roof of locked shields, the Romans demolished the crude and clumsy stone embankment, and in the subsequent fight at close quarters the natives were driven to the hilltops. Our troops pursued them closely. While lightly armed auxiliaries attacked with javelins, the heavy regular infantry advanced in close formation. The Britons, unprotected by

breastplate or helmets, were thrown into disorder. If they stood up to the auxiliaries they were cut down by the swords and spears of the regulars, and if they faced the latter they succumbed to the auxiliaries' broadswords and pikes. It was a great victory.

38. In the Silurian country, Roman troops left to build forts under a divisional chief of staff were surrounded, and only saved from annihilation because neighbouring fortresses learnt of their siege and speedily send help. As it was, casualties included the chief of staff, eight company commanders, and the pick of the men.

39. Shortly afterwards a Roman foraging party was put to flight. So were cavalry troops sent to its rescue. Ostorius threw in his light auxiliary battalions, but even so did not check the rout until the regular brigade joined in. Their strength made the struggle equal and eventually gave us the advantage. However, night was coming on, so the enemy escaped almost undamaged. Battle followed a battle. They were mostly guerrilla fights, in woods and bogs. Some were accidental - the results of chance encounters. Others were planned with calculated bravery. The motives were hatred or plunder. Sometimes these engagements were ordered by the generals; sometimes they knew nothing of them. The Silures were exceptionally stubborn. They were enraged by a much-repeated saying of the Roman commander that they must be utterly exterminated, just as the Sugambri had once been annihilated or transplanted to the Gallic provinces. Two auxiliary battalions, which their greedy commanders had taken plundering with insufficient precautions, fell into a trap made by the Silures. Then they began, by gifts of spoils and prisoners, to tempt others to join their rebellion. At this point, exhausted by his anxious responsibilities, Ostorius died. The enemy exalted that so considerable a general, if not defeated in battle, had at least been eliminated by warfare.

40. On hearing of the Governor's death the Emperor, not wanting to leave the province masterless, appointed Aulus Didius Gallus to take over. Didius made for Britain rapidly. There he found a further deterioration. For in the interval, a brigade commanded by Manlius Valens has suffered a reverse. Reports were magnified - the enemy magnified them to frighten the new general; and the new general magnified them to increase his glory if he won, and to improve his excuse if resistance proved unbreakable. Again the damage was due to the Silures; until deterred by Didius arrival, they plundered far and wide.

Annals 14.

29. The imperial governor Aulus Didius Gallus had, as I have said, merely held his own. His successor Quintus Veranius had only conducted minor raids against the Silures, when death terminated his operations..........So Suetonius planned to attack the island of Mona, which although thickly populated, had also given sanctuary in many refugees. Flat-bottomed boats were built to contend with the shifting shallows, and these took the infantry across. Then came the cavalry; some utilised fords, but in deeper the men swam beside their

horses. The enemy lined of the shore in a dense armed mass. Among them were black-robed women with dishevelled hair like Furies, brandishing torches. Close by stood Druids, raising their hands to heaven and screaming dreadful curses.

30. This weird spectacle awed the Roman soldiers into a sort of paralysis. They stood still - and presented themselves as a target. But then they urged each other (and were urged by the general) not to fear a hoard of fanatical women. Onward pressed their standards and they bore down their opponents, enveloping them in the flames of their own torches. Suetonius garrisoned the conquered island. The groves devoted to Mona's barbarous superstitions he demolished. For it was their religion to drench their altars in the blood of prisoners and consult their gods by means of human entrails.

Agricola

14. Suetonius Paulinus enjoyed two years of success, conquering tribes and establishing strong forts. Emboldened thereby to attack the island of Anglesey, which was feeding the native resistance, he exposed himself to a stab in the back.

17. Julius Frontinus shouldered the heavy burden, and rose as high as a man then could rise. He subdued by force of arms the strong and warlike nation of the Silures, laboriously triumphing not only over a brave enemy but also a difficult terrain.

18. Shortly before Agricola's arrival the tribe of the Ordovices had almost wiped out a squadron of cavalry stationed in their territory, and this initial stroke had excited the province. The war-party welcomed the lead, and only waited to test the temper of the new legate. The summer was far spent, the regulars were scattered over the province, the legionaries were assuming that there would be no more fighting that year. Everything, in fact, combined to hamper or thwart the new campaign, and many were in favour of simply watching where the danger lay. In spite of all, Agricola decided to go to meet the threat. He drew together detachments of the legions and a small force of auxiliaries. As the Ordovices did not venture to meet him in the plain, he marched his men into the hills, himself in the van, to lend his own courage to the rest by sharing their peril. Thus he cut to pieces almost the whole fighting force of the nation. But he recognised that he must not lag behind his reputation and that the success of his first enterprises would decide how much his other enemies would fear him. He decided therefore to reduce the island of Anglesey, from the occupation of which Paulinus had been recalled by the revolt of all Britain, as I described in an earlier chapter. The plan was hastily conceived, and there was no fleet at hand; the resource and resolution of the general had to take the troops across. Agricola picked out the best auxiliaries, who had experience of fords and had been trained at home to swim with arms and horses under control beside them, and made them discard their whole equipment. He then launched them on a surprise attack, and the enemy, who had been thinking in terms of fleet, ships and naval warfare, completely lost their heads. What could embarrass or defeat a foe who attacked like

this? They sued for peace and surrendered the island; and Agricola, in a flash, found himself enjoying reputation and respect.

Appendix 3. River navigation and Justinian's Digest of the Law

The "Digest of the Law" was published by the Emperor Justinian in AD 530, and was intended to codify all Imperial constitutions dating from the time of Hadrian that were still valid. Some 95% of the work is taken from authors of the period between AD 100 and 250 and, in particular, all the edicts quoted below are the work of the jurist Domitius Ulpianus, who at the time of his death in AD 223 held at the office of *praefectus praetorio*. The extracts from Book 43 quoted below clearly give support to the contention that river navigation during the Romano-British period should not have been impeded by the weirs etc. that bedevilled Medieval navigation The extent to which this legislation was enforced, or enforceable, cannot be ascertained, however, it does at least show that if an obstacle needed to be removed, it could be done without recourse to the tedious legal processes that made the later improvement of English rivers such a drawn out process.

Edict 12 is intended to prevent anything from being done in a river, or on its bank, to hamper navigation (*De fluminibus. Ne quid in flumine publico ripave eius fiat, quo peius navigatur.*). It states "You are not to do anything in the public river or on its bank by which the landing or passage of a boat is or shall be made worse". The interdict applies to public rivers (defined as perennial) but not to private rivers, which are stated to be "in no way different from other private places". A river is distinguished from a stream by its size, or by the opinion of the surrounding inhabitants. A river that normally flows perennially, but on occasion dries up in summer, is still considered perennial. The interdict distinguishes between navigable and non-navigable rivers as it "does not apply to everything that is done on the public river or on its bank, but only in what is done to hamper landing and passage of boats, therefore the interdict only applies to those public rivers that are navigable, but not to others". Any obstruction of the footway is prohibited and specific provision is made for the passage of rafts that "is frequently necessary". Drawing off water so the river is made smaller or less navigable, or widening which makes the river shallower is forbidden, as is the narrowing of the river, making the current run faster and equally hampering navigation. It seems that both sea and shore are also protected as a short passage covers "anything being done in the sea or on the shore by which the anchorage, landing, and passage of a boat is made worse". Edict 13 states that that nothing should be done in a private river which might cause the water to flow otherwise than it did last summer (*Ne quid in flumine publico fiat, atque uti priore aestate fluxit.*). The provision is made to prevent a river drying up because of unauthorised tapping by water courses or by changing its bed and, despite the English translation in the title, it also applies to public rivers, both navigable and navigable. There is not a total ban on alterations, as it is understood that "many have diverted rivers altogether and changed their beds for the good of their lands. In matters of this kind, it is right to take into account the convenience and safety of the doer, but only if he does no injury to those living around". Edict 14 deals with navigation in a public river (*Ut in flumine publico navigare liceat*) and forbids "the use of force against such a one to prevent him from travelling in a boat or raft in a public river, or loading or unloading on its bank. I will also ensure by edict that he be allowed to navigate a public lake, canal, or pool". A comparison is drawn with the protection afforded to "someone who is prevented from using a public road", and it is commented that similar protection should be provided in this case also. Edict 15 is translated as "Building up a bank" (*De ripa munienda*) and prohibits "the use of force to prevent such a one from doing any work in a public river or on its bank for the purpose of protecting the bank or the field which adjoins the bank, provided that navigation is not made worse by it". Comparison is drawn with the maintenance of public roads and it is commented, "It is extremely useful to repair and build up the banks of public rivers. So just as an interdict is provided for the repair of a public road, and other had to be provided for the building up the bank of a river" (Mommsen et al. 1985, 578-82).

Appendix 4. Epigraphic evidence for officers of the Classis Britannica

The known inscriptions recording officers of the British fleet have been summarized, by de la Bédoyère (1999, 64), as follows;

AD 83-84: at Trucculensis portus (unlocated).

AD 122-4: at Benwell building a granary during the governorship of A. Platorius Nepos. (RIB 1340 (21))

AD 130-4?: under the prefect M. Maenius Agrippa (formerly tribune commanding cohors I Hispanorum at Maryport, (RIB 823-6). His son was consul in 161/2 which limits the date possibilities. (ILS 2735)

AD 130-5?: at Lympne, altar dedicated by the prefect L. Aufidius Pantera to Neptune. (RIB 66)

AD 140s?: under Q. Baeinus Blassianus. (AE 1974.123)

AD 150s?: under S. Flavius Quietus. (AE 1960.24)

AD 244-9: at Arles, an officer, Saturninus. (CIL xii.686)

Appendix 5. Major cross-channel troop movements

The 14th legion was withdrawn from Britain for Nero's campaign in the Caucasus in c. AD 66/7, returned in AD 69 following the battle of Bedriacum, and were transferred to Germany in AD 70. The 2nd *Adiutrix* Legion was posted to Britain in AD 71 and transferred back to the Danube in AD 85/92 and some time before AD 130, the 9th Legion was withdrawn from Britain. Revolt in the north c. AD 117-20, in which a centurion from Vindolanda was killed, resulted in the reinforcement of the British garrison by the despatch of 3,000 troops from Germany and Spain to the Tyne (*ILS* 2726; 2735). In the mid AD 140s, troops were sent to a campaign against the Moors (*AE* 1960, 28) and by contrast, reinforcements were sent from the continent to Britain in the same year (*RIB* I. 1322). The peace settlement c. AD 175 following the conquest of Sarmatia, resulted in the transfer to the Roman army of 8,000 heavily armoured cataphract cavalry, of whom 5,500 (plus horses and dependants) were shipped across the Channel to Britain (Salway 1993,155-6; *Dio Cass.* 71.16.2). Vexillations of two British legions were transferred to Gaul to aid in the suppression of a revolt in Brittany (*CIL* 3 1919, 8513, 12813; *ILS* 2770) The last decade of the 2nd century must have seen major troop movements, to and fro across the English Channel. Following the murder of Commodus in AD 192, three separate Emperors were proclaimed, Septimius Severus in Pannonia, Pescennius Niger in Syria and the Governor, Decimus Clodius Albinus in Britain. Civil war lasted for four years during which time Albinus removed part of the British army (the number is not known) to support his campaigns on the Continent, but after his defeat by Severus at Lyon, Britain was recovered in AD 197. In AD 208 Severus arrived in Britain with large reinforcements including legionary vexillations (*ILS* 9123), together with the fleets of Germany, Pannonia Moesia to combine with the British fleet. After campaigning in Scotland, probably including close support operations by the combined fleets, Severus died at York in 211.

Cross-channel troop movements continued after the demise of the *Classis Britannica*, with legionary vexillations from Britain, probably accompanied by auxiliary units, being deployed against the Alamanni and the Franks in the campaigns of the mid-250s AD (*CIL* XII 6780). Troops were sent to join the Danubian expeditions under Gallienus, but did not return, as the establishment of the so-called Gallic Empire removed Britain from the influence of the central government in Rome. The integration of Germany, Gaul Britain and parts of Spain to form the *Imperium Galliarum*, will have resulted in the further movement of troops to the continent, but we have no records of the quantities involved; the defeat of the Tetricus by Aurelian in AD 274, ending the breakaway empire.

In AD 286, according to Aurelius Victor (*de Caesaribus* 34.28), Carausius was appointed to drive away the Germans who were infesting the sea (*propulsandis Germanis maria infestantibus*); Eutropius (*Bre.* 9.21) defines the area as "*tractus Belgicae et Amorici*", i.e. the coastline from the Rhine to the Loire on the south side of the Channel. The *Notitia Dignitatum* refers to a "*comes litoris Saxonici per Britanniam*", and this may suggest a unified command operating on both sides of the Channel (Johnson 1976, 64-5). It would seem that Carausius, who was an experienced naval officer, had some success in intercepting sea raiders but was, in turn accused of mis-appropriation of recovered booty. Informed that his execution had been ordered by Maximian he took refuge in Britain and established himself as emperor. His power base was the Roman fleet and he continued to hold Boulogne and significant parts of northern Gaul, was probably the victor in a naval battle with Maximian in AD 289. Boulogne was re-captured by Constantius in AD 297, Carausius was murdered and replaced by Allectus, his finance minister who, after a full-scale invasion across the Channel (Mason [2003, 153] suggests by 500 vessels) was killed in battle (Frere 1978, 376-80) and Britain was returned to the Empire (*Figure* 3.13). Constantius again came to Britain in AD 306 to campaign in Scotland against the Caledonians and Picts and, after achieving victory, he died at York in AD 310. His son, Constantine, was proclaimed Emperor and withdrew troops from Britain to support his successful claim to the Purple (*ibid.* 382 – 6). The death of Constantine in AD 337 resulted in control of the Empire being geographically divided between his three sons, with Britain, Gaul, and Germany being the preserve of Constantine II. Friction with Constans, who held the central sector of the Empire, escalated into war in AD 340 and the consequent removal of troops from Britain to fight in the abortive invasion of Italy. In AD 359/360, Lupicinus, the *magister equitorum,* was sent by Julian to take two bodies of *auxilia palatina* and two *numerii* across the Channel during the height of winter (Salway 1993, 256). According to Ammianus, "the wild tribes of Picts and Scots broke their undertaking to keep peace, laid waste to the country near the frontier, and caused alarm among the provincials, who were exhausted by the repeated disasters they had already suffered" (20.1). The so-called Great Barbarian Uprising of 367 brought a response in the person of Count Theodosius, who crossed the Channel with four regiments of the field army and restored a semblance of order to Britain (*ibid.* 270-1). Yet another usurper, Magnus Maximus, probably holding the office of either *Dux Britanniarum* or *Comes Maritimi Tractus*, led a considerable number of British troops on a successful invasion of the continent in AD 383, capturing large tracts of territory, with the Emperor Gratian being killed in action at Belgrade (*Singidunum*). Maximus was eventually defeated by the Emperor Theodosius (the son of Count Theodosius) in 388 (*ibid.* 282-4). In AD 398 the Vandal general Stilicho brought/sent? troops to Britain to counter an incursion from Caledonia, but in 401 troops were withdrawn to the continent in order to counter a Visigothic threat to Italy (Frere 1978, 406 -7). Some of these troops probably returned to Britain because the last British usurper, Constantine III, was able to muster sufficient force to launch a successful assault on the continent in AD 407, controlling all Gaul and Spain until his eventual defeat by the forces of Honorius in AD 411 (*ibid.* 408-9).

Appendix 6. The food of the soldiers at Vindolanda

The wide variety of commodities consumed at Vindolanda, and described in the tablets, is illustrated below;

Acetum	Sour Wine	*Lens*	Lentil
Alium	Garlic	*Ligusticum*	Lovage
Alliatum	Garlic Paste	*Malum*	Apple
Amulum	Meal	*Mel*	Honey
Apua	Small Fish	*Mulsum*	Wine + Honey
Avena	Fodder	*Muria*	Fish-sauce
Axungia	Pork-fat	*Offella*	Pork cutlet
Bracis	Cereal	*Oleum*	Oil
Buturum	Butter	*Olivae*	Olives
Callum	Pork-crackling	*Ostria*	Oysters
Caprea	Roe-deer	*Ova*	Eggs
Cervesa	Beer	*Panis*	Bread
Cervina	Venison	*Perna*	Ham
Condimenta	Spices	*Piper*	Pepper
Conditum	Pickling Liquor	*Porcellum*	Young pig
Fabae	Beans	*Prunolum*	Plum
Faex	Lees of Wine	*Pullus*	Chicken
Frumentum	Wheat	*Radices*	Radishes
Halica	Semolina	*Sal*	Salt
Caro	Goat-Meat	*Spica*	Cereal
Hordeum	Barley	*Turta*	Twisted Loaf
Lardum	Lard	*Vinum*	Wine
		Ungella	Pig's Trotter

Appendix 7. Summary of events affecting demand in the study area

The events taking place within the boundaries of the study area are **emboldened** thus. The dates are not necessarily as precise as those shown, but, for simplicity, the use of a plethora of "*c.*" has been deliberately avoided.

Date AD	Event	Effect
	Iron Age consumers	
43	Claudian invasion	
43-46	**Vespasian and 2nd Legion campaign westward**	Mining on Mendip. Fort at Charterhouse. Fortlet at Old Burrow.
47	**Conquest of south and east England completed**	South-west peninsula demilitarised – troops released for invasion of Wales. Forts at Nantstallon and Sea Mills.
47-52	**Campaigns of Scapula against Silures and Ordovices**	Forts in Figure +++. e.g. Clyro, Abergavenny, Sudbrook, Monmouth, and Cardiff.
50	**Fortress/fort at Kingsholm**	
52	**Caractacus defeated in battle**	
52-58	**Conquest of Wales continued**	Forts in Figure 10.1 e.g. at Neath, Loughor, Forden Gaer and Castell Collen.
55	**Fortress at Usk**	
58	**Fortress at Wroxeter**	
60	**Paulinus attacks Anglesey**	
60-1	Revolt of Boudicca	Conquest of Wales suspended
69	**Fortress at Gloucester**	
71	**Conquest of Wales restarted**	Forts in Figure 10.2 at e,g,. Llandeilo, Llandovery, Carmarthen.
74-5	**Fortress for 2nd *Augusta* Legion at Caerleon**	
77-9	**Fortress for 2nd *Adiutrix* Legion at Chester**	
78	**Conquest of Wales completed by Frontinus. Finalised by Agricola.**	Forts in Figure 10.2 e.g. at Carnarfon, Tomen-y-Mur, Pennal, Caerhun, Brithdir, Pen Lyn, Trawscoed.
79	Advance to Tyne-Solway isthmus	
80	***Civitas* established on site of former fortress at Wroxeter**	
82	Invasion of SW Scotland	
83	**Roman fleet circumnavigates Britain**	
87	Withdrawal from Scotland north of Forth-Clyde isthmus	
87	**20th Legion replaces 2nd *Adiutrix* Legion at Chester**	
98	***Colonia* established on site of former fortress at Gloucester**	Construction of civic buildings. Cotswold stone available for all types of construction.
100	**Fortress and fort gateways and towers reconstructed in stone. Ramparts faced with stone.**	Stone for basic construction usually locally available, often using river transport.
110	**Reconstruction in stone (or on stone foundations) of buildings in forts and fortresses**	Requirement for basic stone met locally, but stone for monumental masonry often brought in by sea.
122	Construction of Hadrian's Wall begun	Transfer to north of legionary vexillations and majority of auxiliary units during next 10 years. Consequent reduction in "ration strength".
125	***Civitas* status for Caerwent, Caerwent**	Stone for monumental masonry for civic buildings brought in by sea
130	**Large-scale civic construction at Wroxeter**	Stone for monumental masonry for civic buildings brought in by sea and river
139	Re-advance into Southern Scotland	
143	Construction of Antonine Wall begun	Only Caernarfon, Caerhun, Cardiff, Caersws, Leintwardine, Brecon Gaer, Forden Gaer garrisoned.
155	Revolt in Northern Britain (Brigantes ?)	
160-3	Abandonment of Antonine Wall	
163	Hadrian's Wall re-commissioned	
180	Some reconstruction and rebuilding at fortresses	Stone for basic construction usually locally available, often using river transport. Limited increase in ration strength of area.
180	War in Britain - Hadrian's Wall overrun	
191	Albinus (Governor of Britain) claims Imperial throne	
196	Albinus strips Britain of troops for continent	Reduction

	– defeated 197	
193-7	**Earthen and timber defences at Caerwent, Carmarthen, Kenchester, Wroxeter, Leintwardine, Blackwardine (?)**	Timber often brought in by river transport
197-201	Britain restored to Imperial rule	
205	Restoration of Hadrian's Wall	
208-11	Severan campaigns in Scotland	
211	Restoration and repair at Caerleon	
213	Withdrawal from Scotland	
235	**Some troops return to Caerleon and Chester. Limited rebuilding of barrack blocks and some HQ buildings**	Stone for basic construction usually locally available, often using river transport. Increase in ration strength.
250	Iberia ceases to export olive oil	Limited import from Mediterranean does not compensate
260-74	Britain part of Gallic Empire	Reduction of direct sea contact with Mediterranean and Spain.
270-95	Saxon Shore forts built	
275	**Some rebuilding at Caerleon, but fortress no longer in use by end of 3rd century.**	Possible stripping of stone and timber, and shipment to Cardiff for construction of new fort.
Late 3rd c,	**Limited re-occupation of Neath and Loughor. Saxon Shore fort at Cardiff**	
Late 3rd c.	**Fortified harbour at Caer Gybi**	
287-93	Britain under rule of Carausius	
293	Last certain record of *leg.XX* (Coinage of Carausius)	
293-96	Britain under rule of Allectus	
296	Britain retaken by Constantine I	
300-42	Peace and prosperity in many parts of Britain, but towns in decline	
300-325	**Modifications to some buildings at Chester, but significant military presence unlikely.**	Cheshire sandstone locally available.
340-69	Internal troubles; harassment by barbarians	
340-69	**Stone walls and gateways at Carmarthen, Caerwent, Wroxeter, Kenchester**	Stone for basic construction usually locally available, often using river transport
350-53	Britain under rule of usurper Magnentius	
367-9	*Barbarica Conspiratio;* Picts, Attacoti, and Scots attack Britain	
369	Recovery and restoration by the elder Theodosius	
383-8	Britain under rule of usurper Magnus Maximus	
388	Large number of troops removed to continent	
398-400	Victories over Picts, Scots and Saxons by Stilicho	
400?	Last record of *leg. II Aug.* (at Richborough)	
400-2	Troop withdrawals from Britain by Stilicho	
402	New bronze coinage ceases to reach Britain	
406-7	Marcus, Gratian and Constantine III usurpers in Britain	
407	Constantine III removes remaining garrison from Britain	
410	Honorius tells British cities to "look to their own defence"	
410	End of Roman rule in Britain	

Appendix 8. Richard Reece coin periods

Period	Dates	Period – principal rulers
1	To 41	
2	41-54	Claudian Claudius
3	54-68	Neronian Nero
4	69-96	Flavian Vespasian – Titus – Domitian
5	96-117	Trajanic Nerva – Trajan
6	117-138	Hadrianic Hadrian
7	138-161	Antonine I Antoninus Pius
9	180-192	Antonine III Commodus
10	193-222	Severan I Septimus Severus – Caracalla
11	222-238	Severan II Elagabalus – Severus Alexander – Maximus
12	238-260	Severan III Gordian III – Philip – Decius – Gallienus
13	260-275	Gallic Empire Postumus – Victorinus – Tetricus – Gallienus
14	275-296	Aurelianic Aurelian – Probus – Carausius – Allectus
15	296-317	Diocletianic Diocletian – Maximian – Galerius – Constantine I
16	317-330	Constantinian I Constantine I – Licinius
17	330-348	Constantinian II Constantine II – Constans – Constantius II
18	348-364	Constantinian III Constantius II – Magnentius – Julian
19	364-378	Valentinian Valentinian I Valens
20	378-388	Theodosian I Gratian – Theodosius I – Magnus Maximus
21	388-402	Theodosian II Theodosius I – Honorius - Arcadius

Appendix 9. Duration of voyages and passage times

We may obtain some idea of passage times, during the Romano-British period, of sailing vessels operating, by considering some of the recorded voyages made in later periods. Since the Roman period there have been some changes in vessel design, notably the use of the fore-and-aft rig and a second mast, these led to some improvement in performance, but as will be seen, with sailing vessels it is wind, tide and loading/unloading cargo, not solely vessel capability, that are the dominant factors.

Evidence for duration of London voyages in the 16th century

In January 1577, a commission appointed by the Lord Mayor of London produced a set of draft "Orders" that covered the majority of maritime insurance practices. The majority of these documents naturally relate to insurance matters, but there are some references to London the maximum durations for trading voyages to London from various parts of Europe. These indicate periods of one to two months for journey times from the near continent and Ireland, and five to six months from the Mediterranean.

These times do not, of course, reflect solely the minimum period of time on passage. If speed of sailing had been the only consideration, the estimated times would have been much shorter, as the commission noted, in several orders, that a ship could reasonably be expected to sail at three miles (one Spanish League) per hour. Instead, the main part of each specified time reflected the commission's calculation of the extent of delays that could be expected during normal trading voyages. The nature of these delays may be summarised as follows;

(1) interuptions by storms, contrary winds, grounding, fire, pirates, or "the unability of ye shipp";

(2) temporary internment by belligerent powers during wartime or by customs officials at any time;

(3) calling at various ports to load or discharge cargo;

(4) waiting in the Downs or off Dover for instructions for " right Discharge....... within this Realme, or to Saile from thence into France on Flanders".

Drawing comparison with the Roman period, Milne has suggested that "Such features must have been just as prevalent in the 1st century as they were in the 1570s" (1985, 31), and whilst one may argue that neither belligerent powers nor pirates were a threat at that time, they certainly were so in the late 3rd to 5th centuries.

There seems little reason to doubt the general accuracy of the commission's estimates for the relatively long duration of trading voyages, as the insurers' desire for a maximum period would have been balanced by the insurers' preference for a lesser period. This compromise between the interests of the insurer and the insured would have, to some extent, been regulated by the fact that many merchants acted in both capacities (Kepler 1979, 265-8). Whilst these times may seem unreasonably long by modern standards, it is worth noting that Braudel stated that, on average, it took two to three months to cross the Mediterranean lengthwise in the late 16th century (1972, 363).

Voyages in the Bristol Channel and Irish Sea

In 1673, John Tiver, a former boatman, stated that "if the winde and weather prove good, a barke or trough may make her voyage from Bridgwater....... into Wales and there be loaden and returned to Bridgwater againe with her loadinge and the coles and culme where with it is loaded be conveyed from thence to Ham Mills (on the River Parrett) in the space of a week and ordinarily in a fortnight". According to Thomas Games, a purser, voyages could be completed in six days "in seasonable weather", and "very frequently soe to have beene done" in eight days, and a fortnight "att some seasons of the year" (quoted in Hussey 2000, 36; 221).

Between 1695 and 1704, the *Agreement* of Bideford was employed almost exclusively as the local Bristol-Bideford packet, undertaking between five and six round trips a year, but occasionally being diverted into supplementary local freight. From Bristol the vessel was loaded with iron and a range of bulk iron goods and ironmongers' wares, and a motley assortment of haberdashery goods, textiles, leather and skins, hats, wearing apparel and basic foodstuffs such as cheese. In return, copper, copper ore and tobacco pipe clay, formed the principal cargoes, together with small quantities of earthenware and agricultural goods. Fourteen shipments for Liverpool departed from Bridgwater in 1699, picking up substantial cargoes of salt in return. These vessels regularly managed three or four round trips a year and were effectively coasters plying long-distance coastal salt routes (Hussey 2000, 30-8).

Edmund Eglinton worked sailing trows and ketches in the Bristol Channel, Saint George's Channel and the Irish Sea, during the early years of the 20th century and, in 1982, recorded his experiences in "The Last of the Sailing Coasters". Passages within the confines of the Bristol Channel and the Severn Estuary, involved not only waiting for favourable conditions of wind and tide before setting sail, but also anchoring on passage during a "foul" tide, in order to avoid losing ground that had already been made. For example, during a passage from Newport on the River Usk, to Lynmouth on the north Devon coast, it was necessary to "save the water" during contrary tides, by anchoring firstly in Cardiff Roads, and then off Lynmouth itself. The passage of 80 km took 24 hours, a speed of three kph (about 1¾ knots), but the vessel had arrived in darkness and loading could not commence for another 12 hours. A 25 km passage from the River Yeo, north of Weston super Mare to Kingroad, off the mouth of the Bristol Avon, was completed on one favourable tide, i.e. less than 6 hours, giving a speed of c. 5 kph (just under 3 knots). However, the vessel arrived with "the last of the flood", and needed to wait for the next incoming tide (some 12 hours) before passage could be made up the river to Bristol.

In the open seas, faster speeds were possible, but again, were totally dependent on wind and tide. For example, an outward passage to Ireland in the *Garlandstone*, a 25 m ketch, carrying 120 tons of coal from Portishead, on the North Somerset coast, to Courtmacsherry, to the west of the Old Head of Kinsale, a distance of some 225 nautical miles, (c.420 km) took "three full days". This gives an approximate distance covered per hour of 5.8 km, or an average speed of just over three knots. Discharging the coal took a full working day, a return cargo was fortunately available at Bandon, six miles upriver from Kinsale, and the short passage there accounted for a further day. After cleaning the holds, the loading of 80 tons of oats took a further three days, as it arrived in individual cartloads from the surrounding countryside. After a late-evening downriver passage from Bandon, Kinsale was left in the early morning and, in gale force winds, the return passage to Portishead was made in 28 hours at an average speed of 15 kph (just over 8 knots). The effect of a prevailing wind was not restricted to the seas around Britain as, for example, the outward voyage of the Roman grain fleet from Puteoli to

Alexandria, a distance of some 1000 nautical miles, took nine days, but in the summer season, against the dominant north-westerlies, the return voyage lasted one to two months (Casson 1971, 297-9).

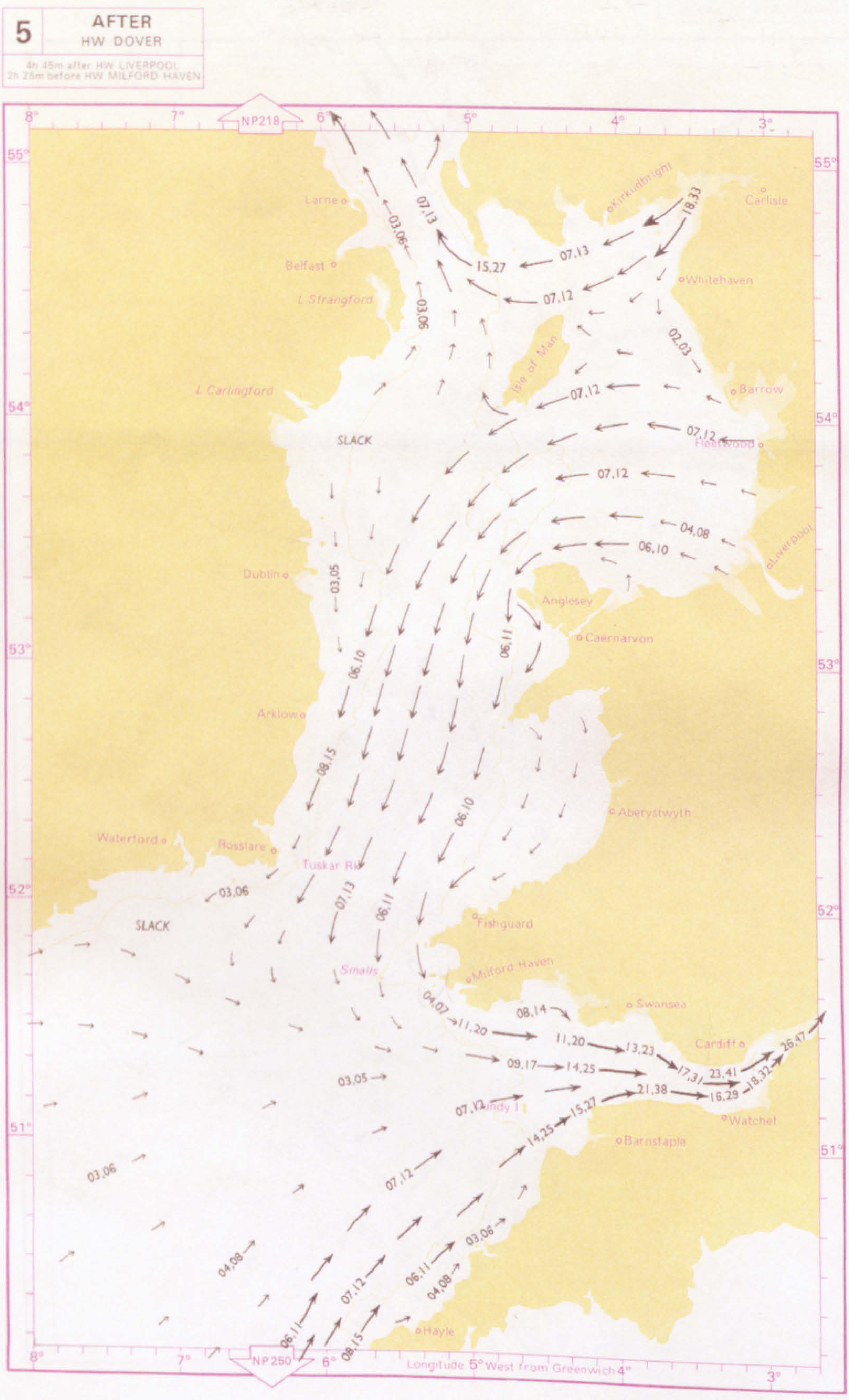
Stowage Factors
(cubic metres per tonne)

Tin ingots	0.22	to	0.28
Lead pigs	0.22		0.31
Lead ingots	0.28		0.33
Iron pigs	0.28		0.33
Iron ore	0.33		0.42
Lead ore	0.36		0.39
Marble blocks	0.42		0.47
Granite slabs	0.45		0.50
Marble slabs	0.50		0.56
Sand	0.53		0.56
Ivory	0.84		0.98
Iron scrap	0.98		0.98
Water	1.00		1.00
Oak	1.00		1.31
Wheat	1.18		1.34
Wheat in bags	1.34		1.50
Barley	1.36		1.50
Hides, baled and dry	1.39		1.67
Elm	1.39		1.78
Barley in bags	1.45		1.67
Loose stone	1.50		1.78
Pine	1.52		1.84
Ivory in cases	1.53		1.67
Wine in casks	1.62		1.78
Wine in cases	1.67		1.95
Olive oil in casks	1.67		1.73
Earthenware in crates	1.70		2.13
Tiles	2.13		2.27
Peat or turf, dry	2.30		2.30
Tiles in crates	2.41		2.41
Hides, dry	2.79		4.18
Hay in bales	3.34		4.46
Porcelain in crates/ cases/baskets/tubs	3.34		5.57
Wool in bales	5.55		6.00

Figures are for bulk stowage, except where noted. . These stowage factors apply to the relatively large and obstruction-free holds of modern vessels: factors for vessels in antiquity would probably have been at the higher end of the given ranges.

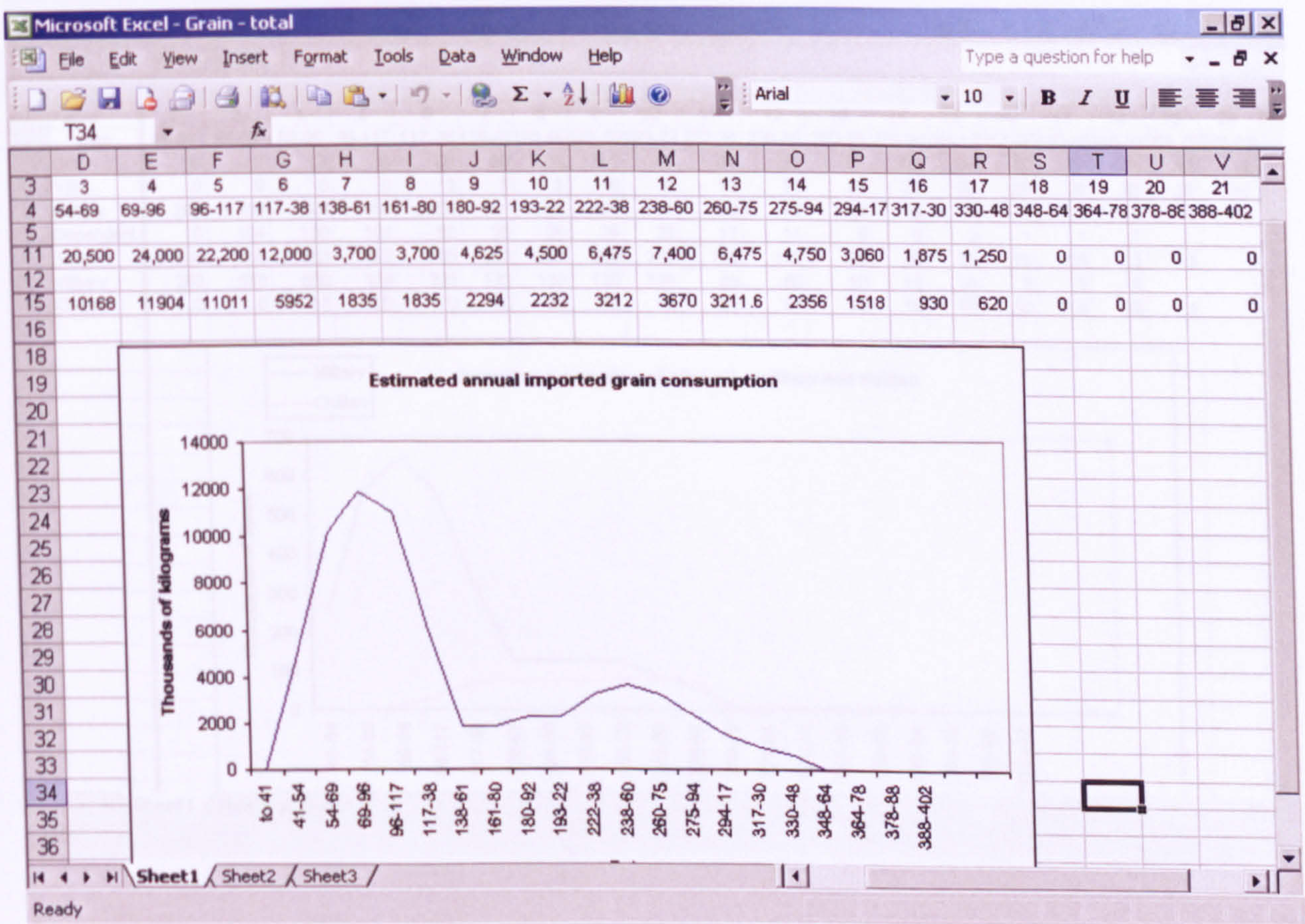
(S.McGrail - Sources: Lewis 1962; Thomas 1983)

Appendix 11. Admiralty Tidal Stream Atlas – Irish Sea and Bristol Channel – maximum flood and maximum ebb



2
BEFORE
HW DOVER
2h 15m before HW LIVERPOOL
3h after HW MILFORD HAVEN
NP218
NP250
Longitude 5° West from Greenwich
Larne
Belfast
L Strangford
L Carlingford
Dublin
Arklow
Waterford
Rosslare
Tuskar Rk
Smalls
Fishguard
Milford Haven
Swansea
Cardiff
Watchet
Barnstaple
Lundy I
Hayle
Aberystwyth
Caernarvon
Anglesey
Liverpool
Fleetwood
Barrow
Whitehaven
Carlisle
Kirkcudbright
Isle of Man
SLACK
SLACK
SLACK
SLACK

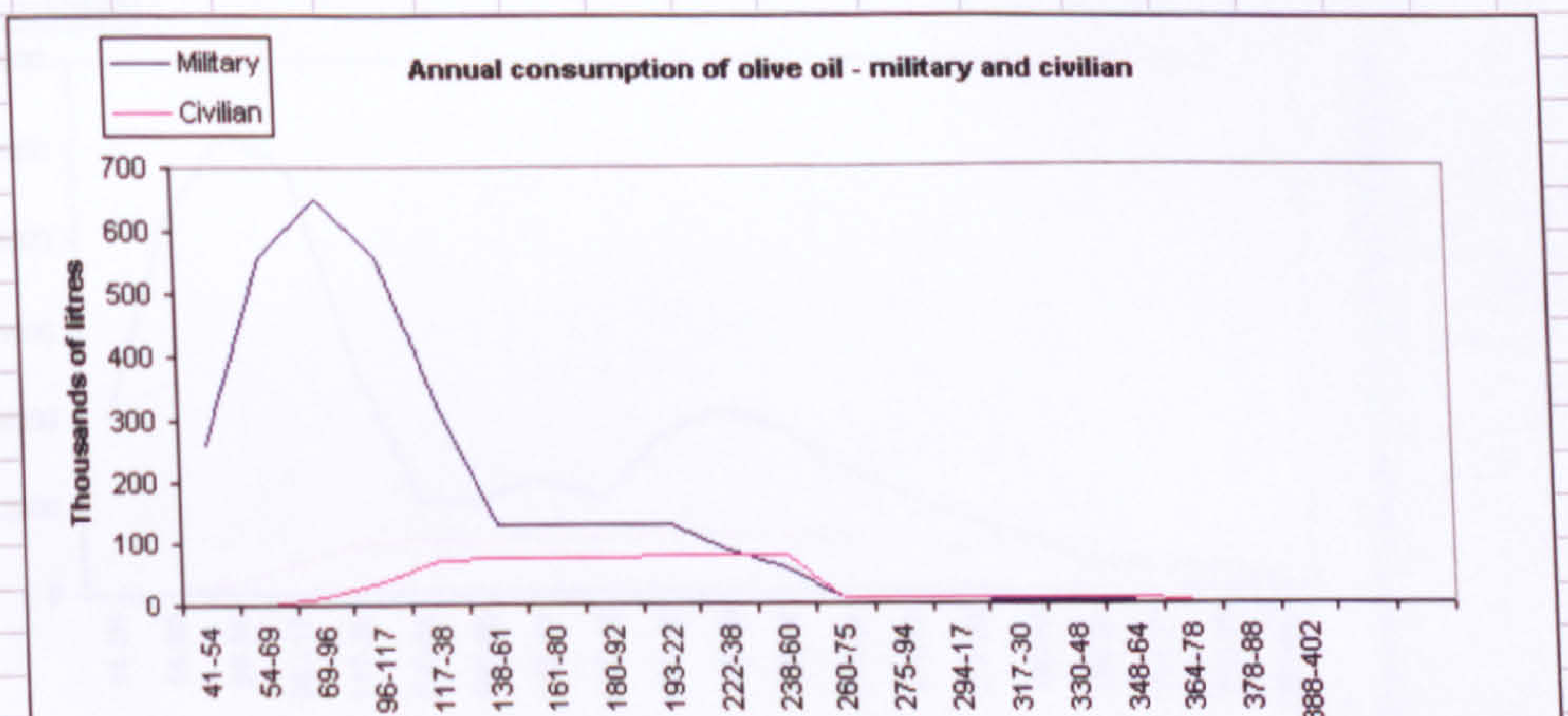
Appendix 12. Demand and supply - Microsoft Excel Spreadsheets



	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
3	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
4	54-69	69-96	96-117	117-38	138-61	161-80	180-92	193-22	222-38	238-60	260-75	275-94	294-17	317-30	330-48	348-64	364-78	378-8E	388-402
5																			
11	20,500	24,000	22,200	12,000	3,700	3,700	4,625	4,500	6,475	7,400	6,475	4,750	3,060	1,875	1,250	0	0	0	0
12																			
15	10168	11904	11011	5952	1835	1835	2294	2232	3212	3670	3211.6	2356	1518	930	620	0	0	0	0

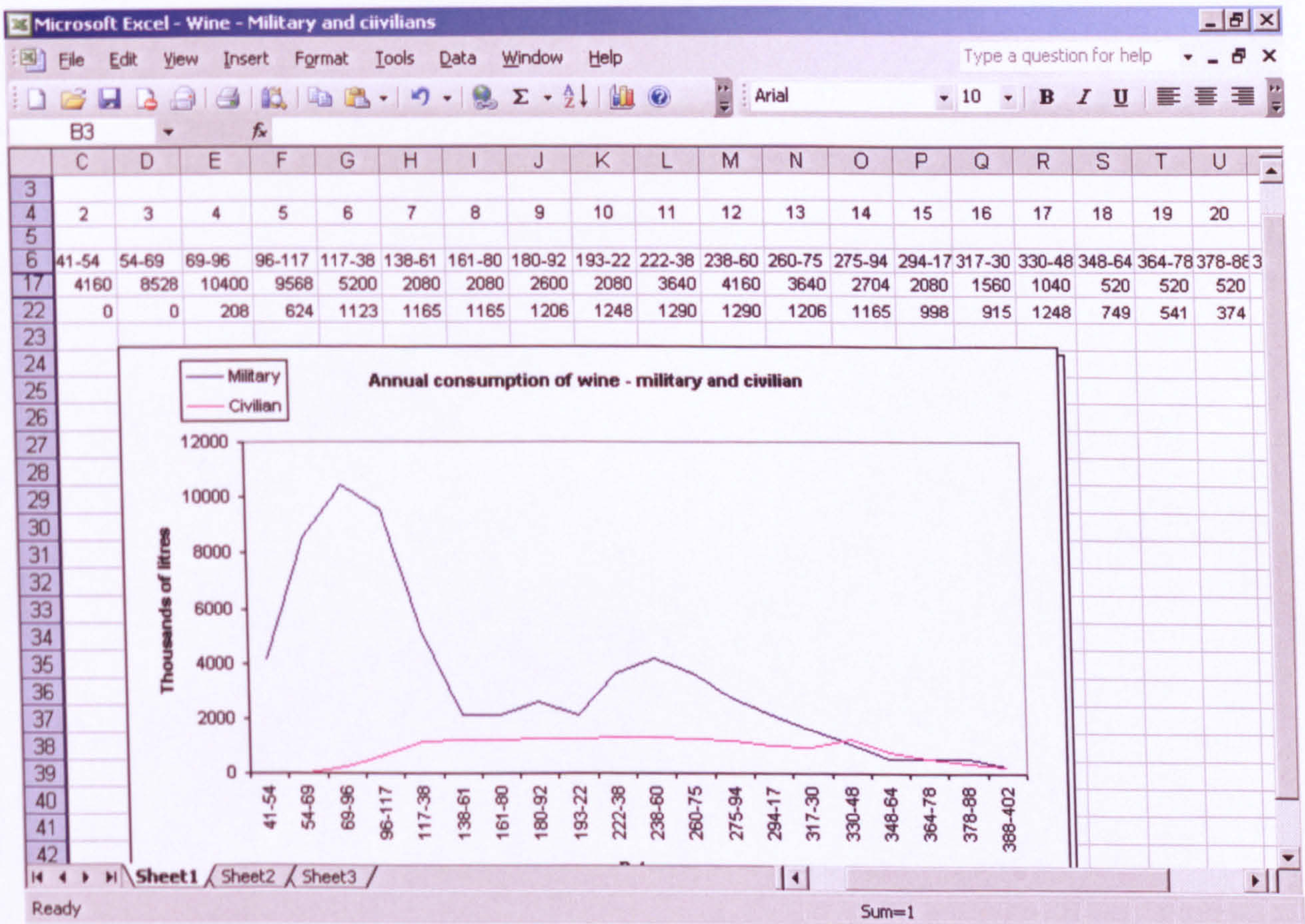
Microsoft Excel - Olive Oil - Military and Civilian

	A	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
1	Period	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
2	Date	41-54	54-69	69-96	96-117	117-38	138-61	161-80	180-92	193-22	222-38	238-60	260-75	275-94	294-17	317-30	330-48	348-64	364-78	378-88
12	Urban	0	0	13	39	68	68	68	68	70	68	62	57	52	39	31	52	21	13	13
13	Villa	0	0	0	0	3	5	5	8	8	13	18	18	21	23	26	26	26	21	10
14	Military	260	455	520	455	260	104	104	104	104	68	45	20	10	5	2	2	2	1	1
15	Dependent	0	104	130	104	65	26	26	26	26	17	11	5	3	2	1	1	1		
17	Total	260	559	663	598	395	203	203	205	208	166	120	20	20	20	15	15	15	5	
19	Military	260	559	650	559	325	130	130	130	130	85	60	10	10	10	5	5	5		
20	Civilian	0	0	13	39	70	73	73	75	78	81	81	10	10	10	10	10	10	5	



Sheet1 Sheet2 Sheet3

Ready Sum=1



	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
3																			
4	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
5																			
6	41-54	54-69	69-96	96-117	117-38	138-61	161-80	180-92	193-22	222-38	238-60	260-75	275-94	294-17	317-30	330-48	348-64	364-78	378-88
17	4160	8528	10400	9568	5200	2080	2080	2600	2080	3640	4160	3640	2704	2080	1560	1040	520	520	520
22	0	0	208	624	1123	1165	1165	1206	1248	1290	1290	1206	1165	998	915	1248	749	541	374